WORK

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FOR ALL WORKMEN, PROFESSIONAL AND AMATEUR.

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AN ORNAMENTAL CLOCK CASE AND BRACKET.

BY J. H. MOODY.

PREFATORY REMARKS — WORKING DRAWING — DEMOLISHING OLD CLOCK—NEW TOP PIECE —FALSE STYLES—RECONSTRUCTION.

THE possession of ample means enables a man to indulge without stint in the purchase of things that are costly and massive, and to fill his house with articles that are pleasing and beautiful; but lack of the needful not only compels him to stifle his acquisitive longing, but sometimes induces him to resign himself to surroundings, the ugliness of which his impecuniosity renders him powerless to alter.

My readers will understand that I do not argue that apathetic satisfaction, amidst lack of beauty, is a natural consequence when a man's means are scanty; indeed, there are notable exceptions to be seen in frequent creditable efforts at decoration in humble domiciles; and some, also, that are even possessed of a high order of excellence; but if the efforts are only crude in execution and vague in design, as the work of an untutored savage, they are still to be commended for the good intention they manifest, and because they are evidence of a desire for a better state of things.

Now, it seems to me that it is part of the mission of WORK to direct and order all these faltering well-meant efforts by showing how they may achieve good result; and they who are capable of good work may take counsel also; for even as it is said that everybody has something yet to learn, so it may be said that a man must be exacting indeed if he fail to find something to interest him in this magazine, or very undiscerning if he fail to perceive profit in the perusal of its pages.

It is quite possible for a man to attain mechanical skill if he earnestly strive for it; and if at the same time he apply himself to improvement in artistic ability, the time will not be far distant when the power to produce beautiful objects will be within his grasp; and if those objects be neither massive nor costly, I venture to say that their inspection will give pleasure, and likewise a vast amount of satisfaction to their constructor.

But lest I be charged with misappropriation of space, I must hasten to introduce my subject, and it is imperative that I should quit the character of mentor and become for the nonce the aspirant who has accomplished a few easy jobs with *éclat*. Being big in the possession of a small stock of good tools, I looked around me, anxious, like another Alexander, for other jobs to conquer. I was, however, not long without work to do, and plenty of it—work wherein my proficiency would be tried. Here are one or two among the list:—An overmantel—to depose the one which had long done duty, and whose worn gilding had long been an eyesore—was my great ambition; then my books were becoming dilapidated for lack of shelves or case; the wife also suggests that a few brackets as receptacles for her treasures in the way of china would look well and assist in the embellishment of the walls of our best room. For my own part, I thought that sundry articles of domestic use might be improved and transformed in a way to suit modern ideas, and accordingly I gave preference to the following:—Among my belongings there was a clock that was a good servant in the household, and I determined that I would provide it with a case more important and ornamental than the insignificant one provided for it by its maker.

A description of this clock as it stood before

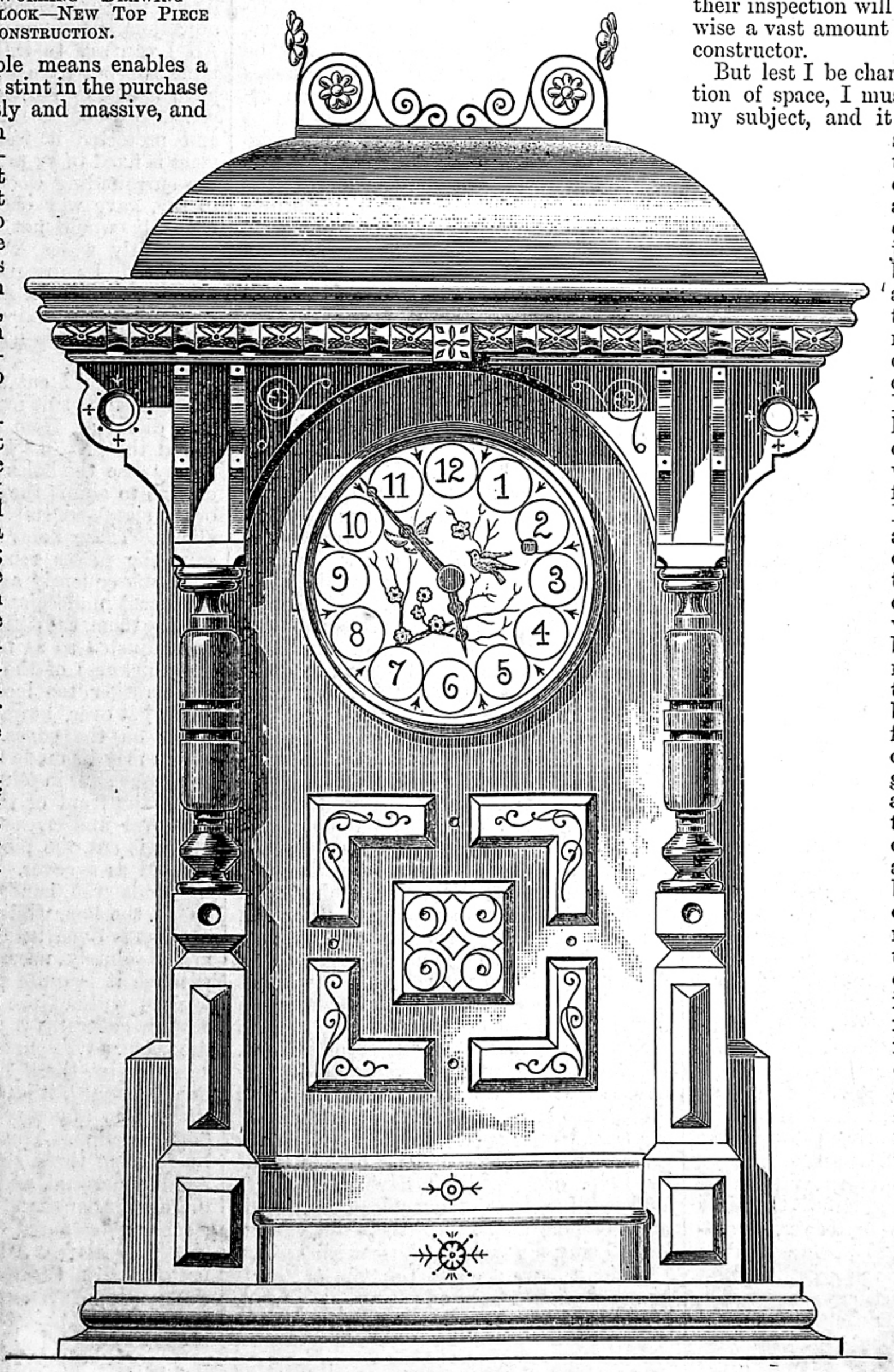
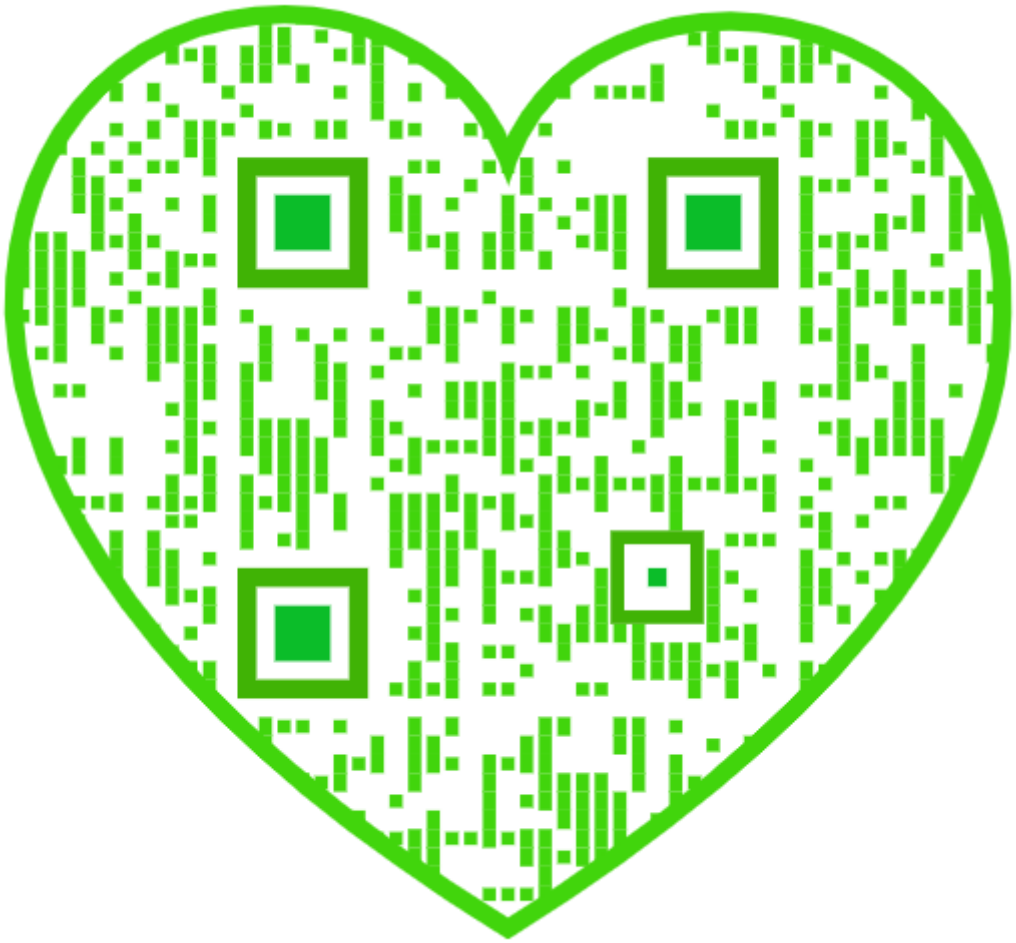


Fig. 1.—Ornamental Clock Case in Front Elevation (half full size).



alteration will give my readers some notion of the work I undertook, and will not tax space very considerably. The movement was a very ordinary brass one with pendulum, and the case was little more than a box with a plinth at front and sides, in which channels were cut to carry the bottom; the top was a flat piece of wood rounded on edge and bradded on; there was also a mitred framed door with glass panels; and the dial was printed on zinc plate. Altogether, my clock was such an one as our American cousins send away in shiploads.

The reader may express wonder that I took trouble over so paltry an article; but, as I have said, the clock had always kept steady time, and that, I apprehend, is as much as a clock, whatsoever its worth may be, is expected to do.

The ornamental case which forms my subject was the result of my deliberation, and when I took occasion to look about me for something to guide me, I could see no example in the clockmakers' windows to assist me. The inevitable marble clocks, said to be models of Pompeian relics or of Grecian temples, were too grand for me, and palled by their repetition. I turned then to the neat clocks in tastefully-designed wooden cases for relief; but their turned pillars and railed galleries did not quite satisfy me. At last I took my cue from some architectural detail, and I developed a very pretty cottage porch to suit my purpose. This is shown in Fig. 1.

The design for a new case being thus arranged, the first step was the making of a full-sized drawing of it. This enabled me the better to conceive how to alter my old friend's appearance, and I began work in earnest by demolishing the construction of the old case. This operation was performed with great care, in order that the severance of parts might be effected without abrasion or splinters; and my reason for preserving the parts from damage will, I think, be perceived, as the wisdom of such a course was apparent to me. When I came to review my clock's requirements, I saw that the same full allotment of width and height for length of pendulum and unwinding of spring were demanded in the new case as the old one had provided; and when the time came for reconstruction, my labours were greatly reduced, as much of the old work was used over again.

The old case thus, by disintegration, thoroughly lost its identity, and the *débris* remaining was examined as to how far the fragments might be adapted to contribute towards the building of the new design. Certain of the pieces, I found, were inapplicable; for instance, the old top piece not being large enough to provide the overhanging eaves, it was condemned, and a larger piece made; the door also was discarded as having no local habitation under new conditions. Among sundry other alterations, the doorway, which extended the whole width of the case, was narrowed by first planing the side pieces sufficiently to take away rebates that I found upon them; I then affixed false styles upon each side piece, to bring the aperture of the doorway within proper bounds. These styles also formed the backing for the two ornamental pillars. Planing the sides of course made them narrower, consequently it was necessary to plane away the side pieces of the plinth to match; and, that being done, the reconstruction was proceeded with. With slight alterations here and there, and a trifle of humouring, the case was soon ready for the attachment of ornament; and I must not omit to mention the cutting away of the front plinth for the top step, and for the setting back of the lower parts of the pillars, which also were cut with laps to bring their surfaces into close contact with the styles. In putting together, I ensured firm attachment of one part to another by using screws. I also used glue wherever its application would be attended by good results.

A PHOTOGRAPHIC CHANGING BOX.

BY L. IVOR POOLE.

RETROSPECTIVE—ADVANTAGES OF CHANGING BOX—DIMENSIONS—MATERIALS—STOPPING LIGHT—WINDOW—HOLES FOR HANDS—HOLE IN FRONT OF BOX—SLEEVES FOR HANDS AND HEAD—HOOKS FOR LID, ETC.—EYES—MODE OF USING BOX—PREPARING PLATES—UTILISATION OF BOX.

Now that summer is once more upon us, and hosts of photographic cyclists will be taking to the road with their wiry steeds and cameras, some description of an arrangement which I found of use may not be unacceptable to those readers of WORK who are riders, though I can no longer call myself one of them. Still, remembering the glorious spins and occasional inglorious spills, the Saturday afternoon runs with their accompanying teas at the famous "Old Salisbury," or other well-known hostelry, I am one with them at heart. As I write how old memories come back: the sixteen assembled in the "Upper Chamber," which sounds better than "Attic," of Ironmonger Lane, there to settle the cycling affairs of the nation, or make as near an approach thereto as circumstances permitted. Portly, pleasant Tod, ably supported by dear old Sheppee, with the General, "Lord" Algy Darnley, Caledonian Craw, and others, who though "lost to sight are to memory dear." Then there's the Phairson with his celebrated song of "The Cat," Nairn (I wonder if he remembers his first ride up Muswell Hill on a sociable?), MacCandlish, Lowe, "Sigma," and the rest of the cycling pressmen—ah! mentioning them reminds me of our "only Editor," him of the C. T. C. But to dwell on these reminiscences won't do; no further progress would be made than sometimes happened at, ahem, a council meeting of the N. C. U.; so mount and away, no more delaying at "Tally-ho Corner."

The changing box about to be described would be rather too cumbrous to be carried with ease on a bicycle, but on a tricycle I have taken it about without inconvenience. I do not say that it is more convenient than taking a number of dark slides with one on a ride, but on tour I have found it very useful, and at home it is hardly less so, when one wants to change a plate without going into the dark room. On occasion plates have been developed in it, though the space is rather too confined for comfort. Perhaps, to sum up its advantages, it may be said that it is very easily made, and that though not so good as some other forms of changing box, it is very inexpensive.

In size, it is 1 ft. 2 in. long by 9 in. wide by 10 in. deep, which I have found quite sufficient for changing quarter-plates. It is made of pine about ¼ in. thick, the various parts being fastened together with screws. The lid is hinged on to the top, or, as it becomes when the box is in use, the front. To prevent any light getting in round the edges of the box at the lid, these are lined on the inside with thick felt, just projecting above them. By this means a light tight joint is made without any difficulty. About the middle of the top piece a square hole measuring rather less each way, say, about ½ in., than a quarter-plate is cut. Round the edges of this hole a rabbet or recess is cut, within which a quarter-plate lies. This plate serves as the window for the box, and, it is almost needless to say, the light through it must be rendered non-actinic. This I managed by merely pasting some of the orange-coloured paper used by photographers over both sides of the glass, and subsequently oiling it to render it less opaque. The glass was then let into the rabbet, which, it should be stated, is on the inside of the lid, and not deeper than just enough to hold the glass. It will thus be seen that this is a good deal below the level of the outside of the lid, and is, therefore, to some extent, protected from injury. Without some other covering, it might seem likely to be frequently broken, and this objection has sometimes been made to it. All I can say to this is that the glass in mine has not once been broken, though I have used the box more or less for some years. Of course I have taken care of it, and protected it from rough usage. The glass is fixed in by tape glued both to it and the surrounding wood. This, I am bound to say, gave way once or twice, though it probably would not if the tape had been sufficiently wide. To prevent mishaps of this kind, I subsequently took a piece of calico, with a hole in it about the size of that in the top, and glued it down instead of the tape. This has been perfectly satisfactory.

In each end I cut a round hole to admit the hands. To suit me these holes are about 5 in. diameter, from which it may be inferred that No. 6 "kids" don't fit me, but in any case the holes should be quite large enough to admit the hand freely and allow of the sleeve-encompassed arms being moved about. These holes were cut with a fret saw, the pieces removed being kept and used subsequently as covers. This renders it almost unnecessary to say that when cutting them, the tilting table of the machine was adjusted so as to form bevelled edges. The thickness of the saw makes the covers fit in rather too loosely, a fault which is easily got over, however, by gluing slips of paper on the edges. By this means the covers may be made to fit perfectly, without any great skill in joinery.

On the front of the box a similar hole, but oval and measuring about 7 in. by 4½ in., is cut, the piece removed being also utilised as a cover. Through the holes in the ends the hands are passed to work inside the box, while the other one admits of what is done being seen. This latter is not absolutely necessary, as with a little practice it is quite possible to do what is wanted without the assistance of the eyes, though generally it is more convenient to use them. Of course, to prevent any light entering by these holes while plates are being changed, it is necessary to close them without in any way interfering with freedom of action. This may be easily managed by forming three sleeves or tubes of some flexible material, and I doubt if anything is more suitable than black holland and the "canary" coloured fabric sold by photographic dealers. A layer of each of these is used to form the sleeves, or, to express it differently, each sleeve is made of double material, one being black and the other the canary fabric. In diameter these sleeves, at one end at any rate, are rather larger than the holes they are to be fitted to. At the

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other end the size is not of so much consequence, provided that those for the arms admit the hands easily, and that the other one fits on the operator's head, or, rather, on his face. This latter may require some explanation, and I do not know that I can do better than state that the face is put in it and looks through it, as it were through a tunnel, into the interior of the box. The head sleeve passes under the chin, over the ears and the top of the head. To keep it in close, and also to prevent it slipping off, the edges are bound with a piece of braid-elastic. The outer ends of the arm pieces are also bound in a similar way, so that on the hands being passed through they closely grip the wrists, without, however, being so tight as to impede circulation. The elastic I have on my box is about 1 in. wide. The ring or garter of elastic is, of course, smaller than the full size of the diameter of the sleeves, which are what I think ladies call "gathered;" but this, no doubt, is part of the making, which will hardly be undertaken by men, and any member of the gentle sex will know how to do what is required without being told if the object is explained. In my own case it was so, and I can only hope others may be similarly fortunate, because I am quite unequal to the task of explaining the mysteries of the needle.

The other ends of the sleeves are fastened to the inside of the box with small tacks, so that when the covers are on they are not visible. The tacks should be pretty close together, and it is to allow of the sleeves being properly nailed down that it has been stated they should be a little wider than the holes. The length of the sleeves is not of much consequence: in my box, those for the arms are about 6 in., and that for the head about 1 ft. long.

To keep the lid close and the covers on when required I used nothing but small wire hooks. Something neater might be adopted, but they have served their purpose, and, by making them myself, I was able to get them just what I considered of a suitable size without any trouble. Four hooks are employed to secure each cover, and six for the lid, that is, two in front and two on each side. The hooks themselves are merely pieces of brass wire bent, with one end forming an eye or ring, through which a small screw nail is passed. To catch the hook over, the "eyes" are short round-headed screw nails. By first fastening the hooks, the exact position of these screws can easily be obtained; and if, at any time, the wire does not catch properly on them, a slight bend soon puts everything right. In this respect they are, perhaps, better than hooks bought ready prepared, as these might not be capable of such ready adjustment. In case any one does not understand the nature of these fastenings, it may be said that the side hooks shown in page 217 of Melhuish's catalogue will do admirably, the smallest size being preferable to the larger ones. Whatever sort are used, however, great care should be taken that they keep the lid close down to the box. As a matter of fact, however, it is seldom necessary to open the lid, as anything to be put in or taken out of the box can easily be passed through one or other of the sleeves. When the box has been stained black inside it is ready for use, but, of course, the appearance is much improved by staining and varnishing the outside.

The way of using the box may be explained as follows:—It is placed with the head sleeve upwards, the lid, containing the ruby window, away from the operator. The sleeves being drawn out, that for the head is first pulled over the face, and then the arms passed through their respective holes. To get the first arm through is not difficult, as the other hand can assist, but the other is more troublesome at first, though, with a little attention, it can soon be managed. Both hands being inside the box, and the eyes looking down into it, it will be found that the operations of undoing plate boxes, wrapping them up again, and all the movements incidental to changing plates, can be performed with the greatest ease. I have, however, found that plates were sometimes injured by the moisture of the breath, but having called attention to the liability to this mishap, it is not necessary to say more than that it can be avoided by not placing the face too close to the plate. Since I found out why the plates were injured it has not occurred. Naturally, owing to the confined space, the atmosphere soon becomes unpleasantly warm and close, but no great inconvenience need be incurred on this score.

In connection with this box, I may mention that I found it a great convenience to prepare the plates in pairs beforehand by putting them together with a piece of black paper between each. A small "dab" of gum or paste on the back of each plate kept them in contact with the paper, so that in changing, instead of having two separate plates with the loose backing to manipulate, there was practically only one. I may go a little further, and say that, by taking this precaution, I have changed many plates when out riding in a mackintosh legging for dark room. An elastic garter was slipped over each end of this, and the plates changed without looking at them. This, however, is only by the way, as it has nothing whatever to do with the construction of a changing box, any more than the mention of other kinds or of portable dark rooms.

The box described will hold camera besides other odds and ends, including the tourist's wardrobe when on tour, provided his impedimenta are not great, as they seldom need be for a few days' run, even though they consist of more than a comb and tooth-brush, and possibly a clean collar or two. When being carried about, the covers, which fit over the holes, hardly allow the box to be distinguished from an ordinary plain one.

Thus our box may be made useful in more ways than one, a desirable thing in these times, when so many things are "contrived a double debt to pay," and combination tools in which one article is made to do duty for three or four are so freely offered as an attraction to all workers on a small scale. And I do not think that many will be found who will quarrel with its adaptability on this score.

It is possible that some few, on reading the description that has been given above, and realising the fact that but little skill and labour are required in its construction, and that there is nothing about it to justify its introduction under some high sounding name, will ask why the subject has been brought under consideration at all. I trust, however, that in this case the result will justify the means, for it has been described in the hope that it may be as useful to cyclists and others as it was to the writer when he was one of "the sixteen"; for though, as already stated, no longer a rider, not the days "o' lang syne" nor "the auld acquaintance" are forgotten.

So "here's a hand my trusty frien',
And gie's a hand o' thine,
For auld lang syne."

A BLOCK PLANE AND PLANE WITH LEVER ADJUSTMENT.

BY A FOREMAN PATTERN MAKER.

A WORD IN SEASON—SHELL OF BLOCK PLANE—PATTERNS—METAL AND WOODEN BOSS—SCREW—QUALITIES OF SHOP PLANES—PIN AS FULCRUM FOR LEVER—LEVER FITTINGS—CUTTING IRON—MERITS OF WOODEN AND IRON PLANES—METAL PLATE ON SOLE OF WOODEN PLANE.

I HAVE noticed once or twice in "Shop" expressions very nearly amounting to strictures with reference to instructions given on the methods to be followed in making certain tools at home, when the tools that are described may be purchased of most hardware merchants and dealers in tools. Others again show as much desire as others evince disinclination for papers such as I am now about to write, and declare that the information that they derive from them is alike useful and welcome. Doubtless there is much to be said on both sides, inasmuch as some have neither time nor inclination to do anything of the kind for themselves, and others are better pleased to use anything that has cost them both time and trouble to make better than the best of its kind that can be purchased at the tool shops. I think myself, however, that the time spent in reading the article is by no means lost, nor the space that is taken up by it in the magazine to be regarded as wasted, for due comprehension of the construction of a tool invariably leads up to better ability to use it. It is far from likely that every reader can find equal satisfaction or benefit from the perusal of every paper, but it is possible to rest contented even with that which may not be immediately profitable to himself when he remembers their importance and utility to others.

Figs. 1 and 2 represent in plan and section the shell of a block plane, which is made either in iron or in gun metal, in various sizes, and under various modifications. It is, however, only worth the trouble of making when not of very small size; useful dimensions would average from 6 in. to 8 in. in length.

I do not show the plane complete, because the wedge and screw are precisely like those shown in Fig. 3, and the same description will apply to both. The latter, Fig. 3, shows a very neat little plane with a lever adjustment for the setting of the iron, and one that can be made without much difficulty. These are to be bought in the shops, but any one possessing a moderate degree of skill in metal working can make two or three of different dimensions for home use.

In each case construct the patterns exactly like their castings, except, that in Fig. 3, the little socketed recess in the piece A will be left to be afterwards drilled and countersunk, as also will the small holes at B and C. Lest the very thin sides should become rammed inwards or outwards by the moulder, plane up a temporary bridge of wood to just fit between the sides. This will preserve their parallelism, and when the sand is rammed sufficiently around the sides the moulder will remove it, and complete the work without risk of getting the sides away from their correct positions.

In Fig. 2 a common wood screw is cast in the metal boss, B, to receive the circular wooden boss, C, which is struck with the hammer in order to release the iron. The pattern of the arched lever, D, Fig. 3, will be cut from a bit of hard close-grained wood, also like its casting. A pattern is also made for the screw, E, whose head is milled in the

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lathe. If made in gun metal the screw and head may be in one piece; if formed in cast iron the screw should be cast into the head. That portion of the screw around which the milled head is cast is made angular, square, or otherwise, to prevent it from working slack with use.

The planes sold in the shops are almost always cast in iron. But the iron is of a specially soft and tough quality such as cannot be always procured in ordinary foundries. In such cases it is much better to use gun metal which will not easily fracture. In such light castings the cost is very little in excess of iron because the labour counts for more than the metal. In any case I should have the lever, D, made in gun metal; even when made of good iron, these levers will often break when a slight excess of pressure is imparted in turning the screw for tightening the iron. I should also have the screw and milled head cast in one in gun metal, rather than cast the screw into the milled head, the screw being apt to work loose in its casting in the course of time.

When cast, file the faces, and drill the various holes required.

A pin is made to bridge across the casting at B in order to afford the necessary fulcrum for the lever. This is riveted in holes which are slightly countersunk.

For the lever fittings in Fig. 3, get a bit of steel bent round, and file it to the outlines in F, Fig. 3, and Fig. 4, filing out also the recess through which the lever, G, operates. Drill the holes, C, H; prepare the lever, G, Figs. 3 and 4; pivot it in place, and then pass the pin, C, through, which attaches the rocking lever, F, to the plane.

The assistance of a smith must be obtained for the cutting iron, Fig. 5, which will be ground to size and serrated while yet untempered. These serrations, as well as those on the rocking piece, will have to be done very carefully and regularly. They number about five or six to the $\frac{1}{8}$ in., and are sunk to about $\frac{1}{32}$ below the level of the under face of the plane iron.

To cut these serrations, get a cold chisel of the same width, and ground slightly keener than the ordinary chisel. Lay the iron on a piece of metal, and, holding the chisel transversely at right angles with the edge of the iron, strike it a smart but dead blow. That will not only indent the metal, but will raise a burr or ridge formed by the displaced metal. This ridge will guide the chisel for the next blow, and so on in succession like file cutting. If the chisel becomes only slightly dulled, re-grind. It will be as well to practise the cutting first on a bit of wrought iron or steel before tackling the actual plane iron. A shorter but otherwise similar series of serrations will be cut upon the top of the rocking piece, Fig. 4, and care must be taken that they are both at right angles, and at the proper pitch or distance, as otherwise they will not enter and mutually coincide.

The only fitting about the lever is that involved in the coincidence of the groove, Fig. 3 B, Fig. 6 A, with the pin, and that of the front edge upon the iron.

When the iron is set approximately flush with the face of the plane, the milled wheel, E, is turned, tightening the iron. Then by the simple movement of the lever, C, upwards the iron is thrust forward, increasing the thickness of shaving: by its movement downwards the iron is drawn back for removing finer shavings. Thus no hammer is ever used on the plane.

A great deal of difference of opinion exists respecting the relative merits of wooden and of iron planes. The reason is not far to seek. Many of the planes sold are such utter rubbish that they will not stand ordinary wear and tear. A broken wedge, due to an extra turn of the screw, and a broken body due to a fall, are not unfrequent accidents. The reason is that they are too often made of the commonest cast iron; and so a tool having good inherent qualities has been consequently brought into some disrepute. But this certainly does not apply to the best iron planes, although, even in these, more care is necessary than in those of wood. An amateur also making his own planes will see to it that good metal is put into them, or will have them cast in brass. For the best indoor bench work, as cabinet making, joinery, pattern making, etc., iron planes have their own special value. Speaking of the writer's own trade, he would deem it quite exceptional to find a workman destitute of at least two or three metal planes. One of the advantages of these tools consists in their weight, another in the greater rigidity of metal over wood, by virtue of which they readily remove fine shavings and operate on cross-grained timber; another is that the sole does not become worn out of truth so rapidly as wood, and lastly they are not affected by heat or moisture. For the lighter and best classes of work, therefore, and for some special purposes, these planes are of service, and I have preferred to describe the making of planes of metal rather than those of wood, because the latter, as a rule, do not offer the same difficulties to amateurs and workmen as the former.

Sometimes a compromise is made in the case of wooden smoothing planes by screwing a plate of metal to the wooden sole, but this has obviously only a limited application.

Referring once more to the manufacture of home-made tools, it is, of course, infinitely easier for the majority of men to work in wood than in metal; and it is this facility in wood working, as compared with dealing with metal, that inclines most men to work in the former rather than in the latter. This, however, should not altogether tend to induce men to discard metal for wood because the former happens to be more intractable.

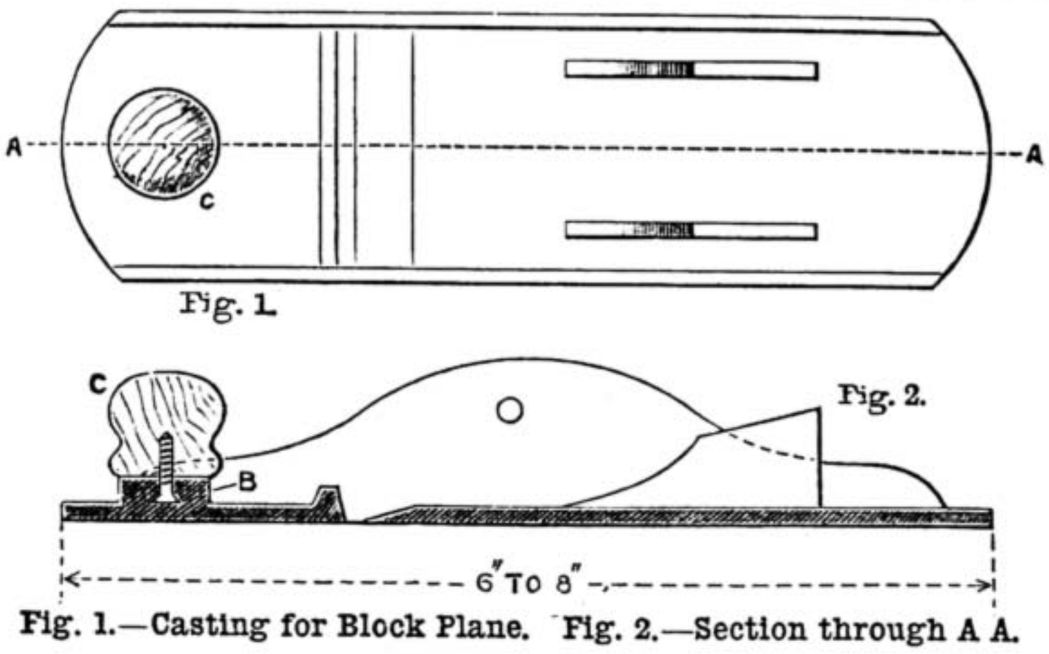

Fig. 1.—Casting for Block Plane. Fig. 2.—Section through A A.

Fig. 4

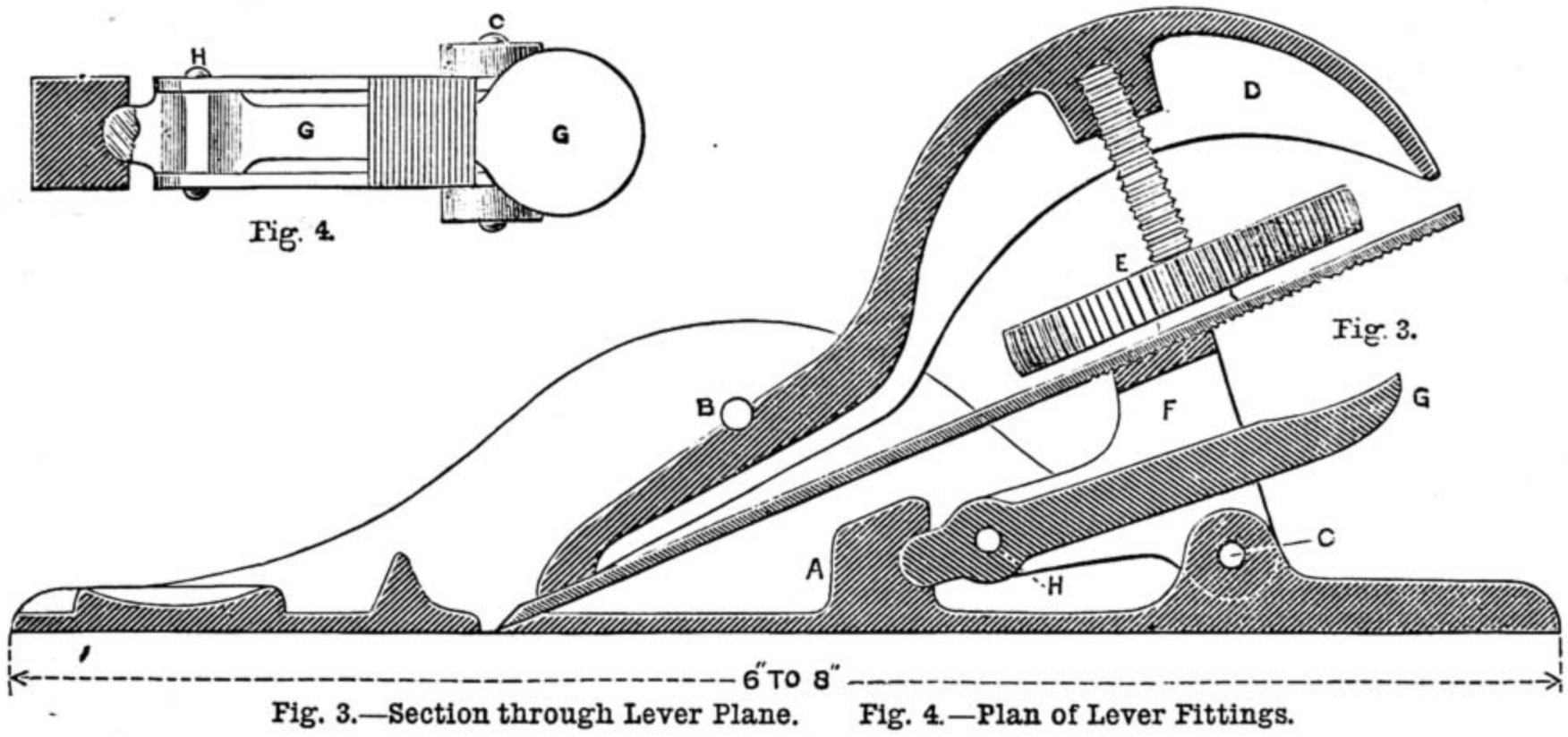

Fig. 3.

Fig. 3.—Section through Lever Plane. Fig. 4.—Plan of Lever Fittings.

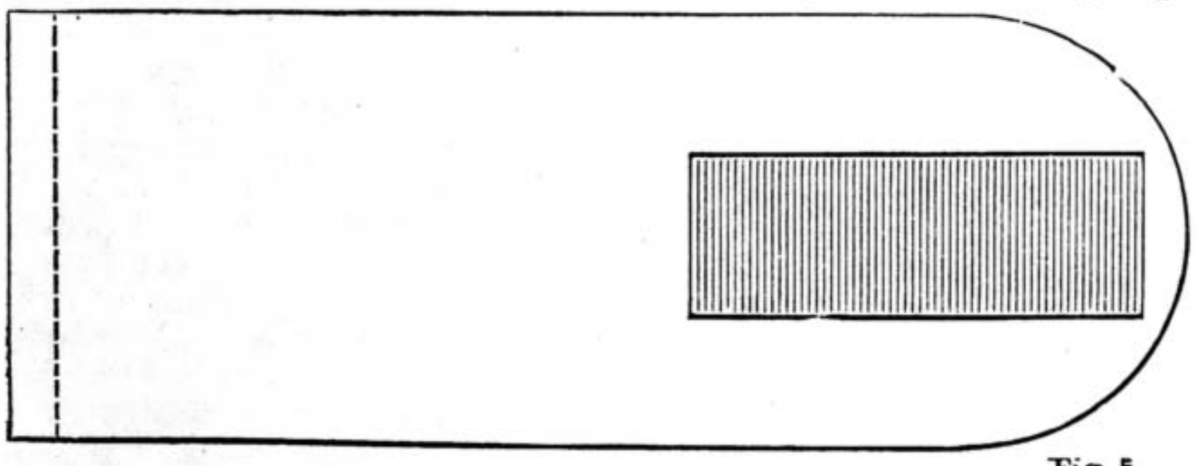

Fig. 5.

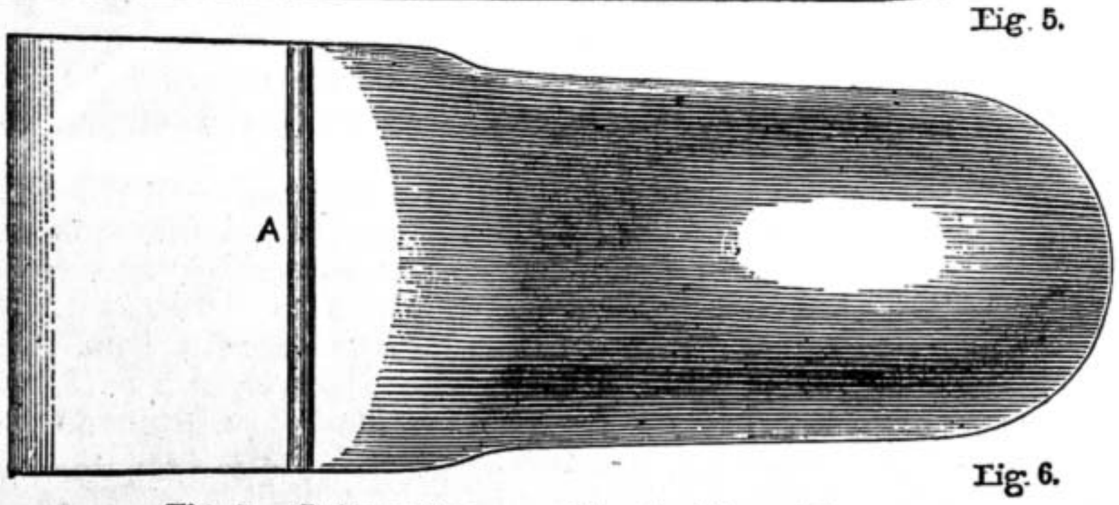

Fig. 6.

Fig. 5.—Cutting Iron. Fig. 6.—Plan of Lever.

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SOME LESSONS FROM AN OLD BUREAU.

BY DAVID ADAMSON.

(*Continued from page* 182.)

ATTACHMENT OF TOP PIECE AND END—MORTISE AND TENON—GROOVE ACROSS ENDS—"RAGGLING" PLANE—FITTING TOGETHER—SUPPORTS FOR ENDS OF DRAWERS—KEEPING RUNNERS IN POSITION—INFLUENCE OF ATMOSPHERIC CHANGES ON WOOD—POLLARD OAK—SPLITTING OF OLD WOOD—DUST BOARDS—THEIR PREPARATION AND FITTING—LID BEARERS—THEIR FITTING.

No special instructions have yet been given regarding the attachment of the top piece (No. 3) to the ends, and it merits a few remarks.

The difficulty of cutting dovetails all along the ends of it and the grooves to match will no doubt have been anticipated while fitting the rails. To manage them neatly will likely tax all the skill of the amateur, while the longer spaces to be fitted to each other in the top will probably be more than he can accomplish. A loosely-made joint—that is to say, the one in which the dovetail slides in so that it does not fit tightly to its groove, is comparatively easy, but then the efficacy of the joint is largely nullified. Rather than have a badly-made joint of this description, it will be better, besides being simpler to construct, to take advantage of the ordinary mortise and tenon, being careful, of course, that the mortises are not cut through the ends. This must not be regarded as a makeshift, suggested by the supposed incapacity of the amateur, for it is a legitimate method, and one that would probably be adopted by the great majority of competent artisans in similar constructions. Many of them also use the same joint, the tenon, for the rails. The top, of course, ought, when the ends are cramped up and the tenons driven home, to fit closely up to the ends of the bureau, but it will probably be found more satisfactory to house each end of the top in a groove cut right across the ends. These grooves need not be deep; in fact, they should not be more than sufficient just to allow the top to enter them. Those who do not mind expense may cut the grooves with a plane constructed for the express purpose of cutting grooves across the grain. It is one not often found in even professional workers' outfits, and as there may be some who do not know that such a tool, though it is not a new one, exists, mention is made of it here. It is called a "trenching" plane, though possibly it is known by other names as well. In "Auld Reekie" it would probably be recognised more quickly if inquired after as a "raggling" plane. In its absence the groove, however, can readily be cut by ordinary tools, a chisel or two, used with care, being all that are absolutely necessary.

Mention has been made of the top being of thin wood, lined up in front of the desired thickness, but special instructions will scarcely be needed after what has been said about the bottom rail, which, if one may so call it, was a reversed lining up. When all the parts mentioned so far have been prepared, it will be as well to fit them together to see that everything is correct, but do not use any glue yet, as they will have to be pulled apart again. We have, as yet, only got bearers or supports for the drawers in front, but there must be other pieces from back to front to support the ends of the drawers, and on which they may slide backwards and forwards. The small upright divisions between the two top drawers, and between these and the lid bearers, should be fitted before proceeding further. They may best be fixed by tenoning them and cutting mortises in the top and in the rail below. The centre division needs no remark about its position, as it may be supposed that any one will be able to ascertain this without being told how; but about the others, those which are between the drawers and the bearers (No. 30),* there may be some hesitancy. The space between them and the inner sides of the ends should be just the thickness of the pieces (No. 30), so it will be as well to have these ready planed up, in order that it may be ascertained to a nicety, or else to keep the space small and plane down the bearers to fit, which is, perhaps, if anything, the better plan. I daresay it will be understood that these bearers are to work backwards and forwards like a drawer, so the importance of fitting them properly will be recognised at once. The pieces now

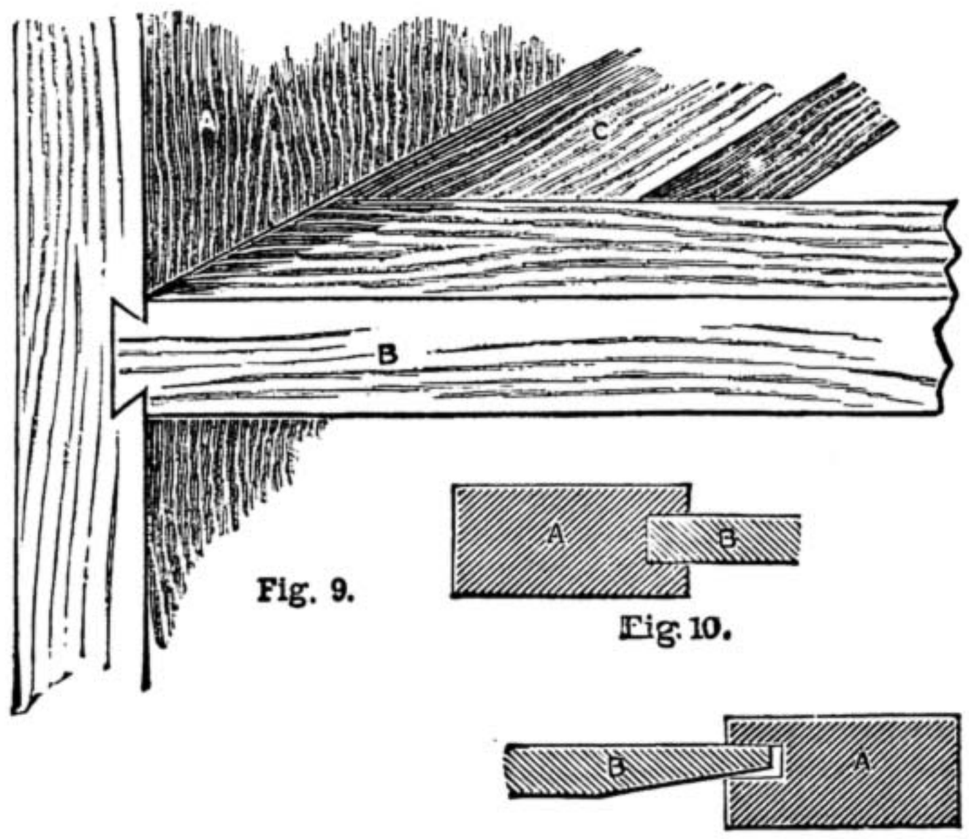

Fig. 9.

Fig. 10.

Fig. 11.

Fig. 9.—End Bearer and Runner. Figs. 10 and 11.—Fittings of Dust Board.

required will be Nos. 31 and 37. The former must be fitted into grooves—say, ⅛ in. deep, running from behind the bearers to the back of the ends. They should be attached to the bearers by a tenon. But Fig. 9 will explain the construction better than any mere verbal description. A is the end of the bureau, B a drawer bearer, and C a drawer runner. These runners must be exactly the same thickness as the bearers to which they are attached, otherwise the drawers will not fit accurately however well they may be made. Not only must they be of the same thickness, but their upper and under surfaces must be level with those of the rails. Now, when all this has been done, it will be seen that the ends and fronts of the drawers will be supported, but some means must be employed to keep the runners in position. The grooves certainly prevent them from falling down when the weight of the drawers is on them, and the joint connecting them with the rails may be enough to keep them from shifting; but they will be further held in place by the boards, which next claim attention. But why not glue them to the ends, thinks the novice, for that, surely, would be strong enough, and save a lot of labour. Yes; certainly it would be *strong* enough, and at first sight it might seem a very feasible method, but a little consideration will show why it is not suitable. As this is one of those details of construction in which inexperienced workers are apt to go astray in their anxiety to glue up and screw up every part to the utmost of rigidity—I don't allude specially to amateurs only here—a few remarks may not be amiss by way of explanation. All wood is more or less susceptible to atmospheric changes. It swells in a moist atmosphere, contracts in a dry—not to any great extent, perhaps, but still appreciably, however well seasoned it may be, the balance of movement being towards shrinkage or contraction for a very considerable time, unless the wood has been thoroughly dried before working up. I allude, of course, principally to interior domestic fittings, not to wood out of doors, where, naturally, the changes are much more apparent. Watch a wooden gate or door, for example. During a long protracted season of dry weather it shrinks so much that it fits quite loosely. When winter comes, or a long spell of wet, cold weather, the same door could do very well with a shaving or two off it. Precisely similar changes, though in a modified degree, occur in all woods, and this natural play must be allowed for and provided against, or it will result in unpleasant consequences. Fortunately the difficulty of contending against it is greatly reduced by the fact that the movement is only lateral, not lengthwise—that is, a plank will only shrink in width, while its length remains the same. It is, perhaps, strictly speaking, not quite correct to say that wood does not contract or expand in length, but the alterations are so slight that, practically, they need not be taken into account. Take a very common instance of shrinkage in wood, viz., the machine-made imported door of a modern medium-class house, put up by that adept in meretricious work, the speculative builder. Look at the gaps between the parts, and remember they all arise from the rails and styles having become narrower, not shorter than they were originally cut, through shrinkage. The same action takes place in the unseen parts, such as the tenons, so that general ricketiness is the result. Now, in fitting the drawer runners to the bureau, it will be seen that their grain runs across that of the sides of the bureau. These sides are almost certain to expand and contract, but the runners will remain of their original length. Well, if the two are glued together, no play is permitted to the ends, which, in that case, are almost sure to split, so great is the tensile property of wood. If, on the other hand, the construction is such that they can expand or contract, the alteration being equally diffused over the width, no harm will ensue, and the slight alterations will pass unnoticed.

I have said that some woods are more uncertain in their action than others, and while we are on this subject I may say that oak, especially the variety known as "pollard," is one with which considerable allowance must be made. It may be some satisfaction to know that action can be largely stopped by stopping the grain up, as is done by polishing. But, say some, surely all this could be prevented by the use of properly seasoned timber. If this

* For references to all numbers as above, see "List of Pieces of Timber required in Construction of Bureau," page 115.

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were correct all cabinet makers would be delighted with the information, but, unfortunately, it is not more reliable than a good many more opinions of the same type. One who knows anything about the subject would not be surprised at the person making such a remark asking why a mahogany slab, 6 ft. wide, could not be made without a join. I would just like to ask those who have such great faith in old work and thorough seasoning, how it happened that one of the ends of the old bureau, which we are taking these ideas from, split from top to bottom, so lately as a couple of years ago. It could not be because the wood was unseasoned, so the explanation must be sought elsewhere. It is simply this. The bureau had been, for some time previously, in a cold, damp place, which had swelled the wood. It was removed to a room continually warm and dry. The wood consequently contracted and cracked, the immediate cause of the crack being a piece of wood fixed across improperly, and so preventing equal contraction.

I have been induced to dwell at some length on this, because it is rather an important lesson to be learned from our old bureau. Having noted it, the fixing of the runners may be proceeded with in the greater confidence of increased knowledge, and as the same principle applies in all similar construction, acquaintance with it will prevent many errors. Perhaps it may ere this have dawned on the reader that the intention of this article is not solely to teach how a bureau may be made, but that useful lessons in joinery may be gathered from it. The same principles are found in all good woodwork, and those that are correct in one piece of furniture are equally so in others. Details may, and must, vary, but the rules of construction do not. Why do I say this? Simply to help the amateur to devise and construct for himself without being obliged merely to copy or to follow minute instructions, giving him every detail of what to do without reasons. In short, the desire is that this article may be educational, leading the worker to think for himself, not simply to "cram" him. Even should he not be desirous of making, it will, at least, give him some ideas how to recognise and appreciate sound, reliable work, and to distinguish between that which is false and that which is correct. I speak now only of constructive not of ornamental details, for as sound construction is, or ought to be, the primary consideration, merely decorative effects must be left for future consideration. May I here say that if I omit to make any point of importance clear to novices, I shall be most happy to do what I can to rectify the defect by answering questions which the Editor may see fit to insert in "Shop."

The fact that wood does not shrink in length is taken advantage of in fixing the thin pieces, sometimes technically known as "dust boards," in such a way that they hold the drawer slides firmly in their places. These boards are sometimes omitted between drawers, and in that case the only way to fix the slides is to run a nail on the slant through their ends into the main piece, and it is just as well to adopt this plan even with dust boards. This still allows a certain amount of play in the end pieces, limited in extent, but generally enough. If the nails were driven straight through at frequent intervals the desired object would be nullified. In the specification these dust boards are given as $\frac{1}{2}$ in. thick, but this thickness is by no means important, for if more easily obtained $\frac{1}{4}$-in. stuff will do equally well. Whatever the thickness a groove must be ploughed along the inner sides of the runners, and continued in the same line along the back edge of the bearers. Fig. 10 shows what is meant. The drawing is given in section, A being the runner or bearer, as the case may be, and B the thin board. It will readily be seen that on the thin board being pushed home into this groove, the runners are firmly held against the ends without risk of shifting, and that a very slight fastening is necessary. When finally putting all the parts together the dust boards may be fastened to the bearers with glue, but not to the drawer slides, in the grooves of which they are free to expand or contract without splitting. It is not meant that they should be loose, for unless they are immoderately tight, any reasonable degree of close fitting will not make them split. These boards, it may be stated, need not run to within a few inches of the back, but it makes a better job for them to go fairly close, and the same applies to the runners. To save unnecessary labour in planing over the whole surface of somewhat thick but otherwise suitable board to make it fit in any given groove that it may be most convenient to plough, the edge only may be planed to a bevel as shown in Fig. 11.

In another respect besides this method is advantageous. The board need not be so exactly cut to length, for the bevel-shaped edge acts as a wedge, and if at all fairly fitted tends to keep the slides firmly pressed against the ends. We have only to follow out the reasons why the dust boards are useful, so far as keeping the slides in position is concerned, to see that instead of nails driven in as previously suggested, a narrow strip, say, some 2 or 3 in. wide, driven into the runners at the back only would answer every purpose. Now, the plane called a "plough," used to cut grooves of this kind, very likely is not found in the possession of the worker, and though undoubtedly a most useful tool, it may be dispensed with in the present case by those who don't care to get it. The cutting gauge, with a little manipulation, will cut the sides of the grooves, and the waste wood between them may be removed by a small chisel. It is astonishing what may be done by the aid of simple tools used with dexterity, for though improvements may be very convenient, it by no means follows that they are necessary. In the present case the chisel may be regarded as a plane without the wooden stock, which serves to keep the blade in one relative position to the piece being cut, and at the same time by not allowing more than a thin shaving to be removed at a time prevents any tearing up. Bearing this in mind it will be seen that the proper way to hold the chisel is with the bevel underneath, and to be careful not to dig it too far into the wood. When the work is fitted up at this stage it will be noted if the lid bearers are put in that though they slide backwards and forwards, they are only prevented from lateral movements, on one side of each, by the ends. The small upright division separating each from the drawer next it is the only thing to prevent them being springy or strained inwards, and this is hardly sufficient, unless, indeed, the divisions have been made much wider than named. Instead of making this unduly wide, another plan will be found to answer better, and it is this. Immediately behind each division, and of exactly the same thickness, fix down with glue or screws to the runner a piece of wood—width not important, but $\frac{3}{4}$ in. or 1 in. will do very well—extending nearly to the back. Against this guide, on opposite sides of course, both the lid bearers and the drawer will slide, and any side shake in either of them be prevented. A similar guide will also be required between the two drawers, with the addition of a slide on which they may run, for it will be seen that the board is lower than the front rail, and there is nothing on which the inner ends of the drawers can rest. Now, there are several ways of fitting this part, but one can hardly do better than follow that adopted in the old bureau.

First of all a piece some 2 in. wide, wide enough to let the drawers rest on it, must be made just so thick that, when it is on the dust board, its upper surface will be flush with that of the bearer. Another piece, the counterpart of those separating the lid bearers from the drawers, will also be required to keep the drawers apart, and prevent them from being strained towards each other. Now, bearing in mind what was said about the play of wood, it will be quite clear that it will not do to glue the centre runner to the dust board, so that some means must be used which, while sufficiently efficacious in keeping the construction securely together, takes into account the properties of the material of which it is formed. Well, we have all that is desired in the method now proposed. Cut a tenon on one end of the piece that is to rest on the runner, and a corresponding mortise in the back of the upright division (the centre one), so that when the joint is complete, there shall be just the thickness of the runner between the dust board and the piece which is tenoned. Glue or nail the runner to this piece, put the tenon in the mortise, but not quite up to the shoulder, and then near the back run a brad through the runner into the board below it and we have all that is necessary. This, though possibly not the most common way, is thoroughly good; and it has the great merit, especially to the amateur, of being very simple, besides which, it is, as I have said, that taken by the maker of the old bureau. Proceeding from the top row of drawers to the bottom one, it will be seen that drawer runners or slides must be fitted there at the ends, for the front bearer is higher than the bottom board. Of course, the slides must be on a level with it, and it will suffice to fasten them with a touch of glue in front and a brad behind. Strictly speaking, this ought to be through a slot cut lengthwise in the runners, for similar reasons to those already given, when speaking of the properties of wood; but practically the brad driven in towards the back is generally found sufficient, and it is no use increasing labour for the sake of theory.

GOLD AND SILVER ASSAYS, ETC.

BY GEORGE EDWINSON BONNEY.

GOLD AND SILVER ASSAYS IN DRY WAY—ASSAYS OF METALS CONTAINING SILVER—ATOMS—ATOMIC WEIGHTS—TABLE OF ATOMIC WEIGHTS.

IN concluding my last paper on matters of interest and importance to electro-platers, I intimated that it was impossible for me to complete in page 202 the subject of Assaying on which I had entered. I now resume my notes on this process.

Gold and Silver Assays in the dry way are more difficult, and they require the use of a muffle furnace. Those manufactured by Thomas Fletcher, of Warrington, give every satisfaction. The sample is weighed as for a gold assay, and the

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copper or other alloy is extracted from the gold and silver by cupellation in the muffle furnace. The weighed sample is wrapped in twelve times its weight of pure lead foil, and placed on a boneash cupel in the furnace. Here it is first melted with the pure lead, and then the molten lead is oxidised by admitting air to the muffle. The boneash of the cupel absorbs the liquid lead oxide, and with it the oxides of any oxidisable metals present in the sample, leaving on the cupel a bead of pure gold and silver. This bead is first weighed to ascertain how much of the combined metals it contains, then the silver and gold is parted in acid as for a gold assay, and the pure gold remaining is accurately weighed. By deducting the weight of gold from the weight of the bead left on the cupel, the weight of silver is ascertained, and the sum total of gold and silver, deducted from the weight of the sample, will show the remainder to be copper or some oxidisable alloy. Boneash cupels are small cups or crucibles made of boneash damped and compressed to the requisite form and consistence in a steel mould, then dried and baked. *Silver assays in a dry way* are performed in a similar manner by cupellation in a muffle furnace. A small portion of the silver of a sample is carried over with the oxidised metals on the cupel, and is lost. The ratio of this loss is ascertained by placing a check sample made up with a known weight of silver and copper on a cupel in the furnace with the samples to be assayed. As the silver in this sample is accurately weighed both before and after the process, the difference between these must represent the loss of silver during cupellation, not only on this but also the other samples cupelled with it.

Assays or Analysis of metals known to contain silver may be performed in the wet way. A weighed sample, as in other assays, is first dissolved in dilute nitric acid, and the solution thus obtained is evaporated until all the free acid has been driven off. The residue is then dissolved in distilled water in a large beaker, and to this is added a solution of common salt as long as a precipitate is formed. When this ceases, the quantity of salt solution used is accurately noted, and as this solution is made up of a known weight of salt in a known quantity of water, the exact weight of salt used to precipitate all the silver in a sample can be ascertained to a nicety. Knowing that the chlorine in a salt solution combines with silver in the proportion of 35·37 parts of chlorine to 107·66 parts of silver, we can easily calculate the weight of silver in a given sample of an alloy. This would seem to be a perfect method of assaying samples of silver alloys, but there are sources of loss and probable errors in this as in others. It is not easy to ascertain exactly when enough salt solution has been used, even when dropped from a burette. The addition of a solution of common salt (chloride of sodium) to a solution of nitrate of silver throws down the silver as a chloride, and leaves nitrate of sodium to form in the liquid, and this is able to dissolve some of the silver chloride, thus causing an unascertainable loss. The presence of silver in the supernatant liquid can always be ascertained by adding to it a drop of a solution of chromate of potassium, when if any silver be present it is thrown down in the form of a blood-red precipitate of silver chromate.

Atoms.—"Matter is made up of small indivisible portions which are called *atoms*. These atoms do not all possess the same weights, but the relation between their weights is represented by that of the combining weights of the elements; thus the atom of oxygen is taken to be sixteen times as heavy as the atom of hydrogen, and the weights of the atoms of nitrogen and oxygen as fourteen to sixteen." (Roscoe.) This law of combining weights was first enunciated by a chemist named John Dalton, who further based on this law the conclusion that chemical compounds must contain their constituents in the combining proportions, or in multiples of them, and in no intermediate proportion. For example—gold will combine with chlorine as a monochloride, that is, one equivalent of gold (196·2 atoms) added to one equivalent of chlorine (35·37 atoms) making a molecule of the molecular weight of 231·39 atoms. It will also combine with chlorine as a terchloride, consisting of one equivalent of gold (196·2 atoms) to three equivalents of chlorine (35·37 × 3 = 106·11 atoms), making a molecule of the molecular weight 302·13 atoms. But gold does not combine with any other proportion of chlorine.

Atomic Weights.—The following table of the atomic or combining weights of the more common and useful elements will show at a glance their value.

TABLE OF ATOMIC WEIGHTS.

Name.	Symbol.	Atomic Weight.	Name.	Symbol.	Atomic Weight.
Aluminium	Al.	27·3.	Lead	Pb.	206·4.
Antimony	Sb.	122·0.	Lithium	Li.	7·01.
Arsenic	As.	74·9.	Magnesium	Mg.	23·94.
Barium	Ba.	136·8.	Manganese	Mn.	54·8.
Bismuth	Bi.	210·0.	Mercury	Hg.	199·8.
Boron	B.	11·0.	Nickel	Ni.	58·6.
Bromine	Br.	79·75.	Nitrogen	N.	14.01.
Cadmium	Cd.	111·6.	Osmium	Os.	198·6.
Calcium	Ca.	39·9.	Oxygen	O.	15·96.
Carbon	C.	11·97.	Palladium	Pd.	106·2.
Chlorine	Cl.	35·37.	Phosphorus	P.	30·96.
Chromium	Cr.	52·4.	Platinum	Pt.	196·7.
Cobalt	Co.	58·6.	Potassium	K.	39·04.
Copper	Cu.	63·0.	Silver	Ag.	107·66.
Fluorine	F.	19·1.	Silicon	Si.	28·0.
Gold	Au.	196·2.	Sodium	Na.	22 99.
Hydrogen	H.	1·0.	Sulphur	S.	31·98.
Iodine	I.	126·53.	Tin	Tn.	117·8.
Iridium	Ir.	196·7.	Tungsten	W.	184·0.
Iron	Fe.	55·9.	Zinc	Zn.	64·9.

Some of the rare elements are omitted from this table, but may be found in Roscoe's text-book of chemistry. In calculating the combining weights of elements, it is usual to take round numbers instead of the exact decimals, thus:—Silver, 108; gold, 196, etc. For further information, see notes on *Combining Weights*, *Equivalents*, *Molecular Weights*, *Valency*, etc. etc.

SOME RUSTIC CARPENTRY.

BY ARTHUR YORKE.

RUSTIC CARPENTRY SPECIALLY FITTED FOR GARDEN PURPOSES — WOODS SUITED TO RUSTIC WORK—LARCH—A RUSTIC GARDEN ENTRANCE—OAK FOR GARDEN CARPENTRY—THREE ADDITIONAL DESIGNS FOR RUSTIC FENCES—A SECOND GARDEN ARCH ON TWO PILLARS ONLY.

THERE are few of those who have gardens and who work in them who do not more or less dabble in some sort of garden carpentry. Unlike indoor work it demands no nice skill and no varied assortment of tools. Carpentry for the garden is everybody's work, whence it may reasonably be inferred that what I have to say about it, by pen and pencil, will have everybody's attention.

The description of carpentry of which I shall have more especially to speak is that known as rustic work; that, namely, which uses its materials in a natural state, and in that state endeavours to make them decorative. For this, as I take it, is the only style really suitable for garden purposes. Our sense of good taste points out that in our gardens all things ought to be in harmony with and suggestive of nature. Glass, metal, paint, which are suggestive only of the shop and of artificial life, we feel to be out of place. Anything of the nature of a greenhouse—whatever efforts may be made to render it ornamental—never appears to a cultivated eye as otherwise than ugly; whilst the rustic summer-house, with its wooden walls covered with natural bark, its low roof of thatch, and its decorations of moss and fir cones, gives unmixed satisfaction. And this style, whilst the most desirable in which to work, is at the same time the least costly and the most simple.

In the course of these papers I hope to do some service to my fellow-workers by pointing out, so far as I can, what is good taste in garden decorations of this class; by supplying designs, or what may furnish hints to them in designing, and by giving some little practical information with regard to material and construction. I shall hope before I finish to deal with a variety of summer-houses, seats, fences, and similar matters.

There is scarcely any kind of wood which may come to hand in a natural state which is not available for rustic work, though some sorts lend themselves to our purpose more readily than others. In most country districts one has generally a wide choice of materials, and not much more than a firewood price to pay for them; some little trouble has, however, to be taken to look out for and to secure them, as they are not like sawn deals, always to be found in stock at the timber yard, and bought at any time they may be wanted.

The example of rustic work shown in Fig. 11 will look and be best if constructed in larch only. Of all our common English woods this may be said to be most valuable for rustic purposes. Its straight growth specially fits it for the carrying out of decorative designs; it is enduring, lasting longer in exposed situations than any other ordinary wood—heart of oak only excepted—and wearing, perhaps, ten times longer than those portions of the oak which are available for garden purposes; and it is plentiful, for larch plantations now abound in most districts, and when they are thinned the rustic carpenter should look out for his supply. The larch poles grown in thick plantations are better for our purposes than such as grow singly, they taper more gradually and have fewer branches. The larch is a most accommodating tree, flourishing, apparently, almost as well in an old stone quarry or a disused clay pit as in the richest of soils, so it is no wonder that it is largely planted. The wood of spruce and other firs which have the same symmetrical growth may do almost as well for our work as regards appearance, but they do not last like the larch.

There are many modest gardens to which a fence and wicket entrance, like that shown in Fig. 11, might be found pleasing and appropriate; and it would be cheap even though a professed carpenter had to be engaged to construct it. But it is a point in favour of my rustic design that the owner, if he can use a saw and a hammer, and likes such amusement, can just as well put it up for himself. Rustic work looks none the worse because the workmanship may be rough; and I flatter myself that no great knowledge will be needed to understand my designs. I have done my best to make them simple, and purpose to give full explanations.

The general view, Fig. 11, is as nearly as

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may be drawn to a scale of ½ in. to the foot; the details shown in Figs. 4, 9, 3 are, for the sake of clearness, on a larger scale, ¾ in. to the foot, so that the exact dimensions of every part may be easily ascertained. The arch rises to a total height of 6 ft. 8 in.; its width from centre to centre of the side pillars is 3 ft. 6 in. The pillars, exclusive of tenons at their tops, show a height above ground of 5 ft., but another 2 ft. is supposed to be buried in the ground where it is rammed in with stones and earth like a gate post. The builder will, of course, set them upright by a plummet, and if he takes off the bark from those parts which go into the ground, and gives them a good coating of gas tar, he will find them last longer.

Rustic work, in a general way, is merely nailed together, but in the design before us the pillars are supposed to be mortised into the pieces which rest on their tops, the bars of the gate into the head and hinge tree, and the rails of the fence into the fencing posts. Fig. 1 shows how the shoulders of

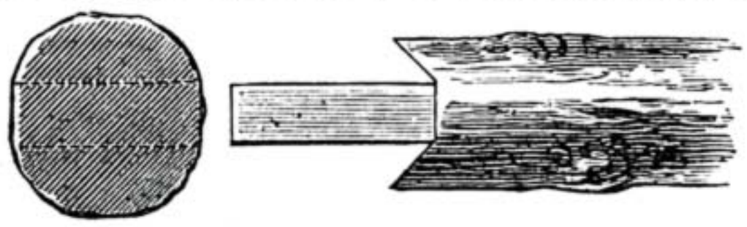


Fig. 1.—Rustic Mortise and Tenon.

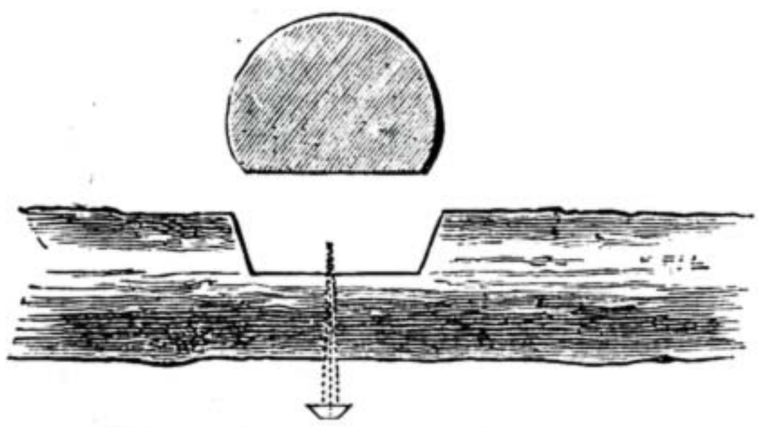


Fig. 2.—Rail and Post cut to Nail.

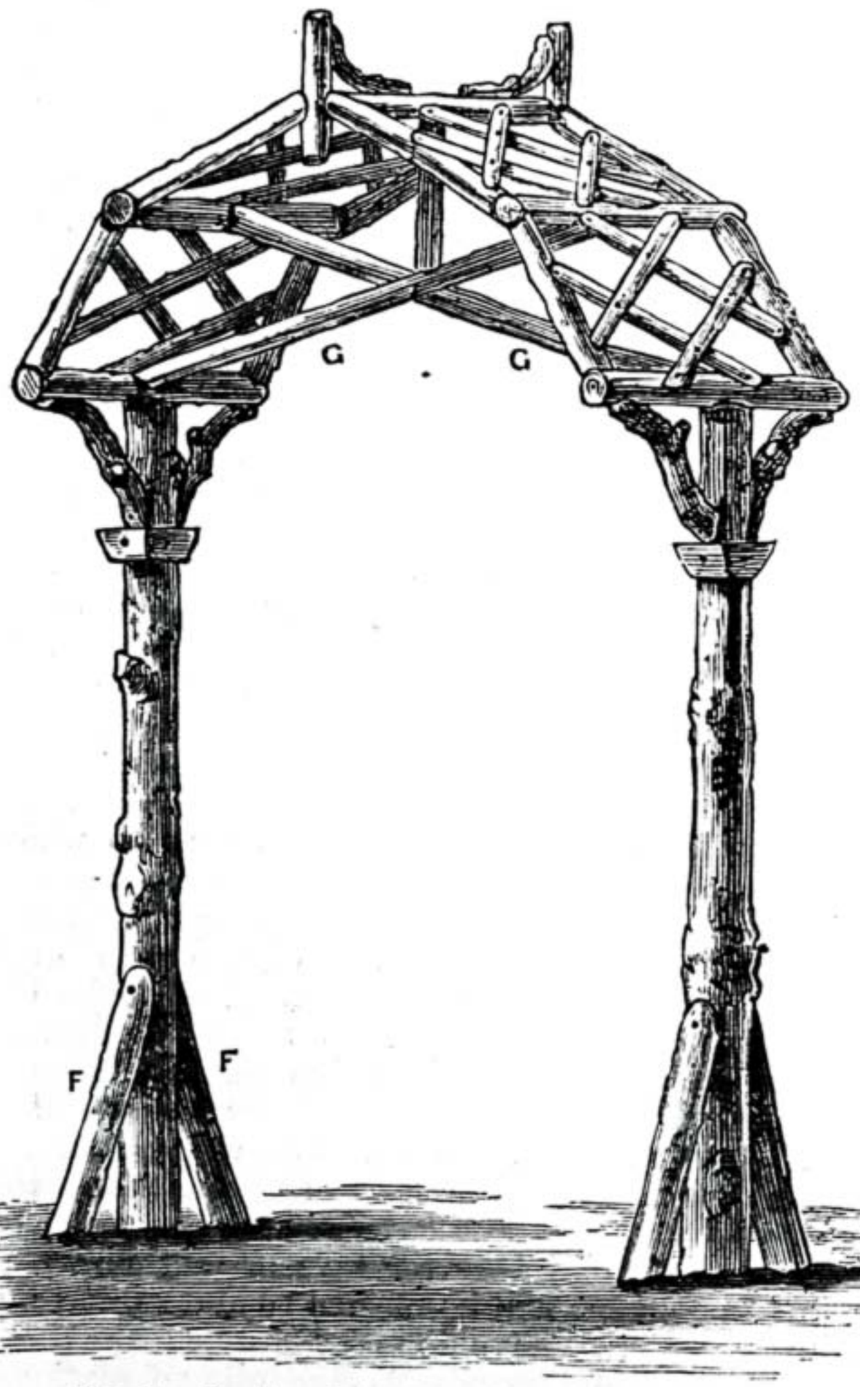


Fig. 6.—Garden Arch with Two Pillars only.
(Scale, ½ in. to 1 ft.)

tenons are sawn so as to make them fit best to the rounded wood. But if this work is taken in hand by any non-professional, who does not feel himself equal to making mortises, he may make a joining, which will neither be quite so strong nor quite so well looking, by cutting each piece something in the manner indicated in Fig. 2, and driving a nail.

In Fig. 3 that side of the gate is shown to which the upright palings are nailed, but it should be noted that on the opposite side the diagonal pieces, A and B, must not be made of short lengths merely going from bar to bar, but must be in one length from top to bottom; they are not for ornament only, but act as braces, and are necessary to give the gate its required strength.

In the example of fencing shown in Fig. 11,

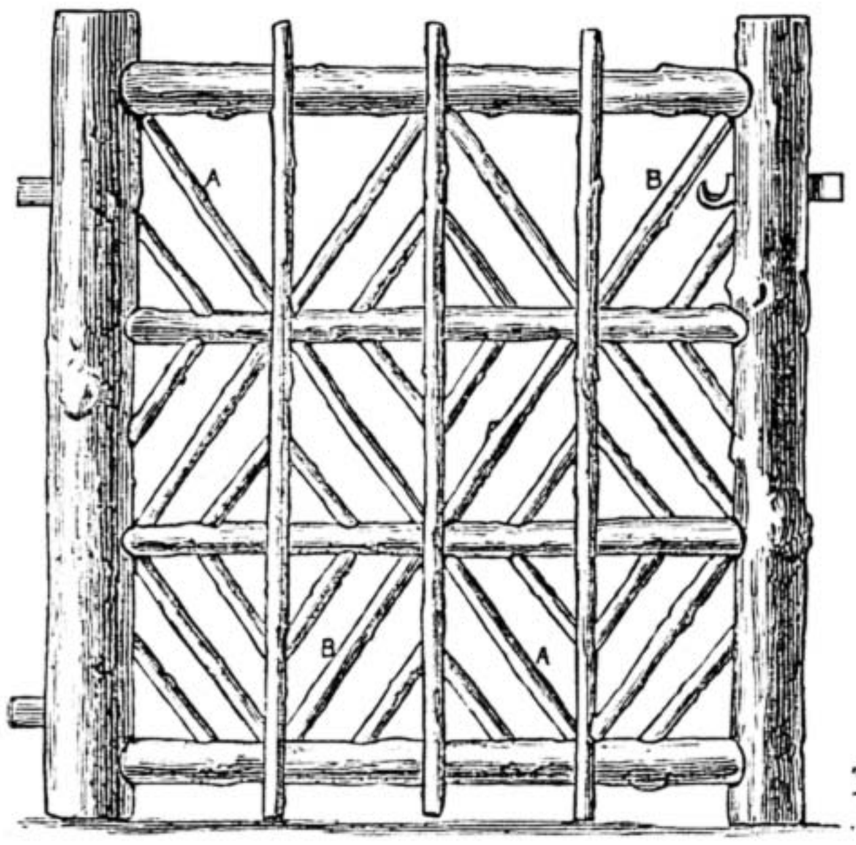


Fig. 3.—Rustic Gate.
(Scale, ¾ in. to 1 ft.)

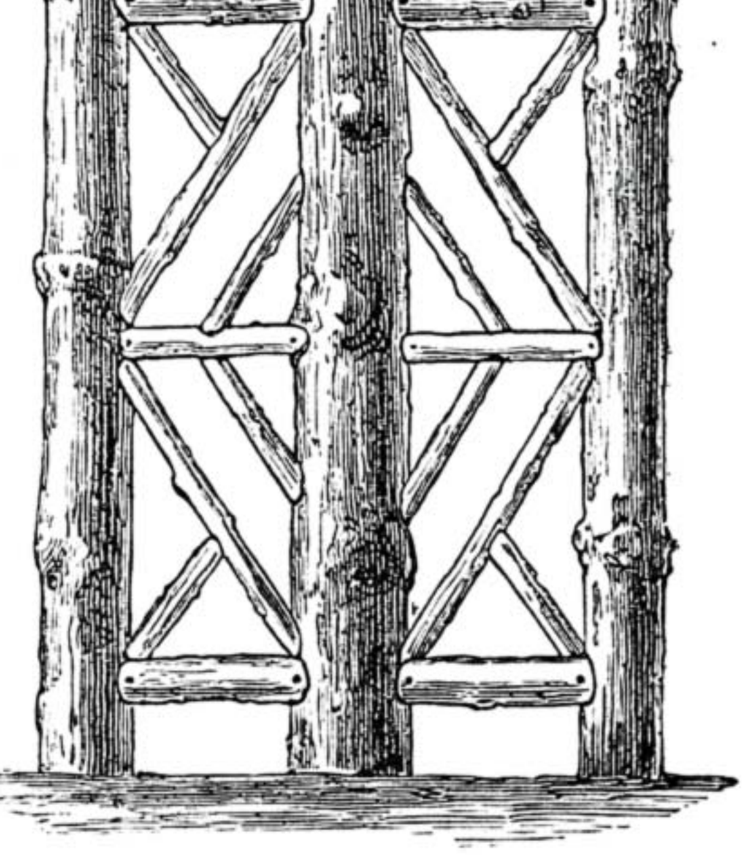
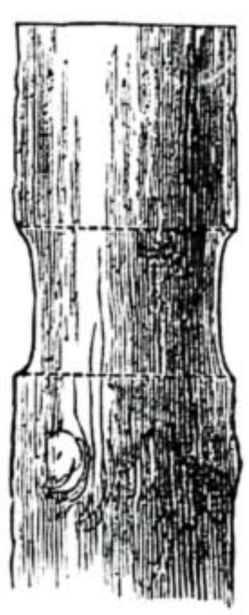


Fig. 4.—Side of Arch.
(Scale, ¾ in. to 1 ft.)

Fig. 5.—Rail Ends cut to meet in Mortise.



the posts are set 7 ft. 6 in. apart. This is a short distance; fencing posts are frequently set at wider distances up to 10 ft.; in Figs. 7, 8, 10, they are drawn as 8 ft. apart. These posts, as also the gate posts, need to be set as deep in the earth as the pillars. Fig. 5 illustrates the manner in which the tenons of the rails fit together in the mortises of the posts. The end, C, is, of course, adjusted to the mortise before the post is fixed, the end, D, afterwards. The stuck, E, Fig. 8, which is let into the earth with a crowbar and then nailed to the rails, prevents the latter from having any motion in the mortises.

The smaller stuff, of which the palings and the lighter work generally are made, should properly be of larch as well as the heavier pieces, not only for the sake of appearance, but that the whole may wear together. With care such stuff may be provided from the tops and branches of the larger poles, and from the thinnings of young plantations. In the example before us, Fig. 11, the palings are nailed about 5 in. distant from centre to centre, and will exclude most small animals, but if special protection is desired against chickens, etc., the number of palings may be doubled, shorter palings, to rise about 1 in. above the centre rail, being nailed alternately with the present ones. The fence would then look a trifle heavier, but would keep out anything bigger than a sparrow.

The superiority of such a fence as the above to those in rustic work which we ordinarily see is very considerable. Those common in this country are almost invariably made of oak "bangles" set, as nearly as may be, to cross each other diagonally. Oak bangles, it may be explained, are the smaller branches of the oak, and as we get them they have been stripped of their bark for the uses of the tanner. Their knotted and twisted forms render them picturesque, and they have, therefore, a decided value for the rustic carpenter. But for fencing purposes they are not satisfactory; their crooked and uncertain growth forbids them being worked to any regular design; it also renders difficult the arrangement of them at such set

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intervals as will effectually exclude animals, but their worst point is that when exposed they decay very quickly. This is always a serious disadvantage, and especially so when, as is often the case, the rustic fence is intended as a support for roses or other climbers; for by the time the climbers are so grown as to be ornamental, the fence is apt to fall to pieces.

Possibly the reader has an idea that among English woods oak is pre-eminent for its powers of endurance. If so, he is in the main right; but the part of oak which lasts for centuries is the heart—that central growth which is always separated from the bark by a ring of softer and lighter timber known as "sap." Few kinds of wood rot more quickly than sap of oak. The smaller branches have little or no heart; they are nearly all sap, and hence their rapid decay. They last best in the dry, but even there they are more subject to suffer from grub than any wood of the fir kind. One point in their favour is, however, that they are cheap; for if not used for rustic work, their only value is for firewood.

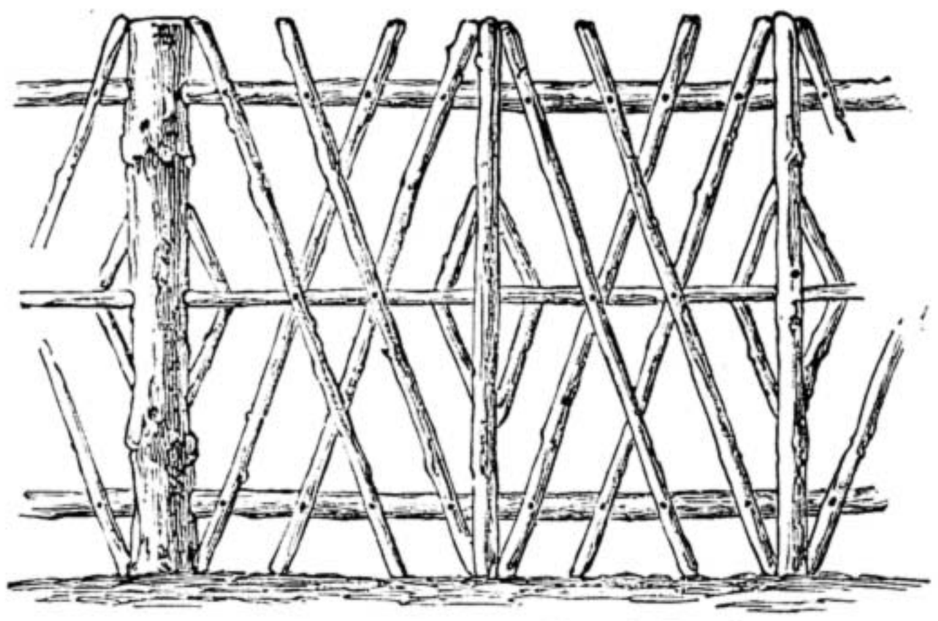


Fig. 7.—Rustic Fence in Rough Larch.

Our larch fence will outlast two or three successive ones of oak bangles; as a safeguard it can be made more secure, and in appearance it will be more artistic. The arrangement of the stuff in ornamental patterns may be varied almost endlessly. In Figs. 7, 8, and 10, three additional designs are given (on the ½-in. scale), and these will doubtless suggest still more varieties to the ingenious reader.

Fig. 6 is a second design for an arch, which may, if preferred, be made to take the place of that in Fig. 11 at an entrance. The two pillars, by which it is supported, might well carry such a gate as that in the last-named diagram, as any extra strain thus placed upon them would be compensated by the support given by the rails on either side. It would, however, be desirable to retain the bottom stucks (F, F, Fig. 6), since the weight of the upper part of the arch being considerable, it might, if not accurately balanced, tend to pull the structure out of the perpendicular if deprived of these supports. This arch in its upper part is, it will be observed, strongly tied together by the braces, G, G. This arch is on the same scale as Fig. 11 (½ in. to foot). It is the same width as the one there given, and 7 ft. 6 in. high.

In Fig. 11, every portion of the arch, with the very trifling exception of the apple-tree knots, with which the lower ends of the pendants are finished, is of larch; but in Fig. 6 are half a dozen pieces of some other wood, namely, in the struts at the tops of the pillars, and in the ties which connect the two pinnacles with the top of the ridge piece. In these a curved form is more pleasing than a straight one, and bits of apple tree have therefore been introduced.

Either arch will also do equally well for use within the garden to span a path and serve as a support for climbers, and will, I flatter myself, look effective in such a position. It is possible that some one may object that the wooden arch thus contrived and made has not the light appearance of, and takes up more room than, the light arches of iron now much used, in which the sides are made of substantial wire—or thin bar iron as I may almost call it—fitted to feet of some width terminating in spikes that enter the ground, and give stability to the structure when placed in position. The standards thus made are connected by trellis work of wire which fills the interval between them. In a trim town garden where everything is prim and rectangular, and laid out with line and rule, the iron arch may be preferred as a support for the roses or other climbing plants that are trained to its sides and top. In the country garden, however, the rustic arch will be more in keeping with the surroundings, and harmonise more effectively with the masses of old-fashioned flowers, long established favourites, that have not yet been sent into exile to make room for the contrasted colours of modern gardening, in which fragrance invariably gives place to brilliancy. With these few plain instructions a pleasant employment is introduced to those of our readers who enjoy garden woodwork.

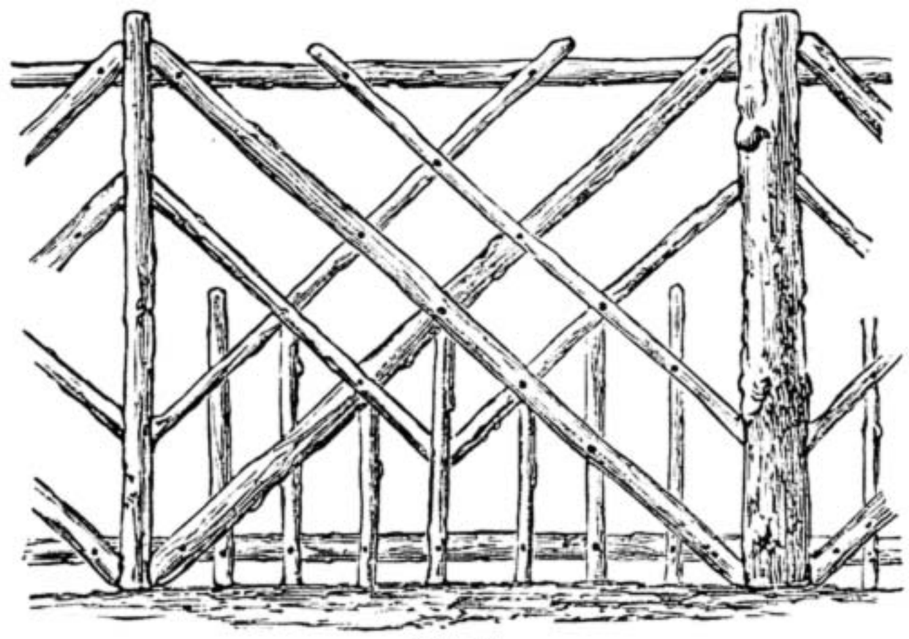
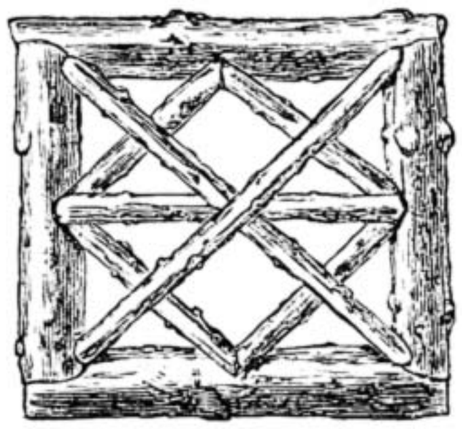


Fig. 8.



Figs. 8, 10.—Rustic Fences in Rough Larch.

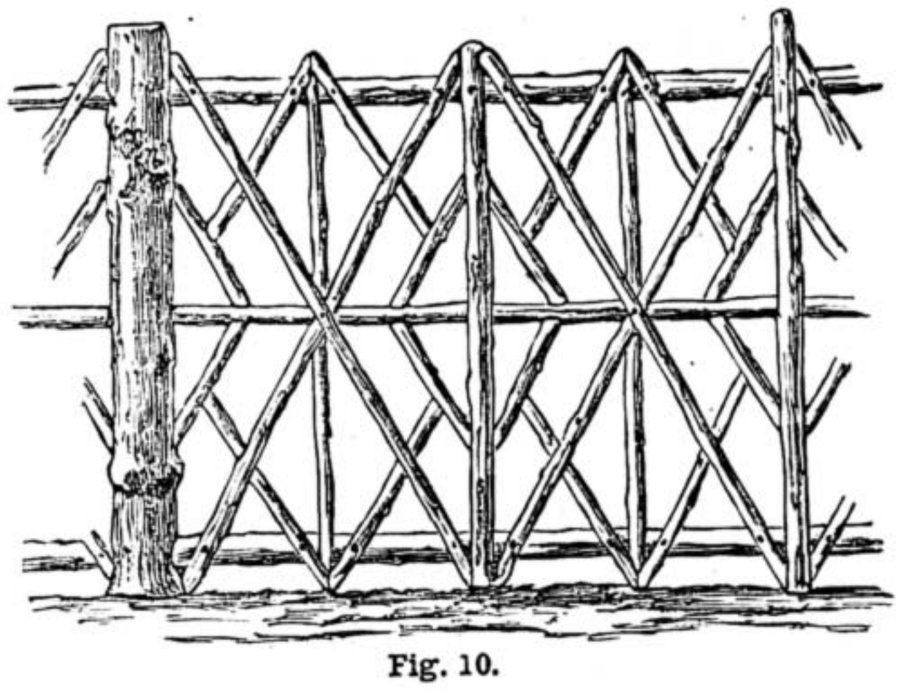


Fig. 10.

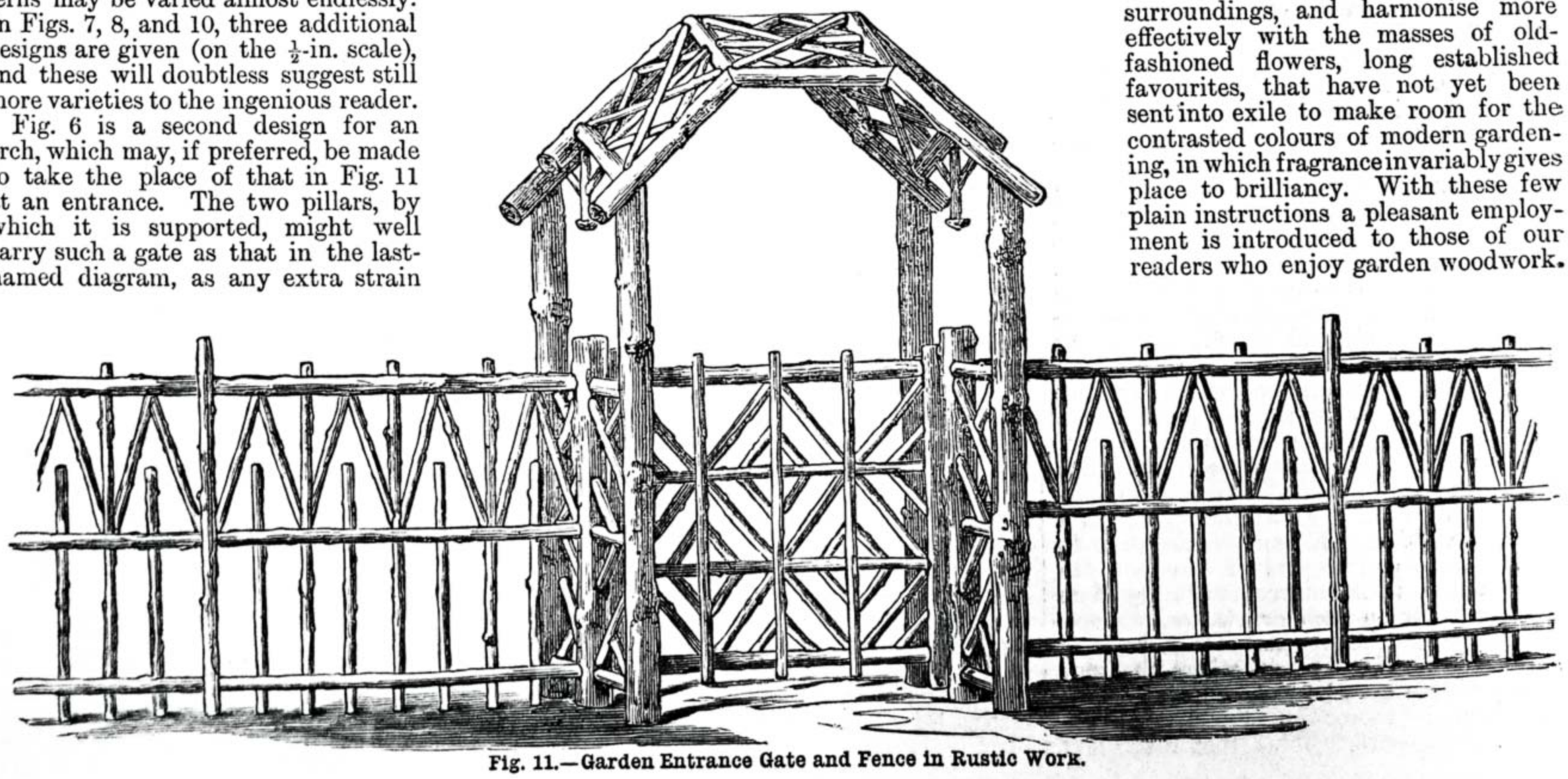


Fig. 11.—Garden Entrance Gate and Fence in Rustic Work.

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JOINTING UP—FOR "'PRENTICE HANDS."

BY DAVID ADAMSON.

Plain Glued Joints.

Anything new? perhaps you may ask on reading the heading, and I have pleasure in at once telling you—No. So, therefore, good people who know all about it, your valuable time need not be further taken up with the present subject. I am addressing myself to novices, and not to experts. I can teach the former something, perhaps, but not the latter just now; and if any of these should grudge the space given to those who are, as it were, just feeling their way, will they, the said experts, kindly remember their own early days, and be generous to those who do not even know how to join two boards together?

Now, of course, as far as mere joining goes, boards may be joined together in many ways, the simplest being, perhaps, by laying one on top of the other and nailing them together. This method is seldom, if ever, required, and if the novice should ever have occasion to use it, the manipulation must be left to his native ingenuity. Not to make a long preamble and run through all the joints used in wood working, or from the multiplicity of them, as it is commonly called "joinery," let me say that I purpose confining myself to attaching boards by their edges so as to obtain any required width.

This work is what is known in many places as "jointing up." I say many places because terms are often only of local use, and an expression that may be perfectly well understood in one district, may convey no meaning in another part of the country. Still, I think "jointing up" is sufficiently understood to warrant its being used to express the kind of joint which is the subject of explanation, and, for aught I know to the contrary, it may be the general term all over England. Be that as it may, I do not think I have ever known a practical cabinet maker who did not know what was meant by it.

Possibly some—only those, however, who have never tried it—may fancy that any one can glue two boards together, and that directions may be superfluous. There can be few who are not physically capable of "jointing up," but the novice will find that he has a good deal to learn before he can do so satisfactorily, that is to say, satisfactorily to those who are able to distinguish between good and bad workmanship. So far as a few general directions can do so, I hope his difficulties may be diminished. Verbal instruction is, however, only of use to indicate to him how he should proceed, and it stands to reason if not practically applied will be useless. It cannot give the manual dexterity, and this is not to be acquired without care.

Just to show clearly and distinctly what a perfect joint is, or let me say rather, a perfectly fitted joint, let us compare two of a different quality. In one we see the line of the joint quite easily. There is no mistaking it for most of its length. There is a dark line, thicker in some places than in others, from end to end of the join. In some places it is interrupted every here and there for an inch or two, or, perhaps, even more; all the glue seems to have been pressed out. These places where the glue is not visible are the only ones at which the joint is thorough. Further, on examining the board, we find that instead of being perfectly flat there is an angle at the joint. Very slight if you like, but quite perceptible if a straightedge be laid across.

Now let us turn to the other piece which has been jointed. But stop, you say; for has it been jointed, or is it not one single piece? No line is discernible anywhere, but let us look closely and we shall find that the grain of the wood is stopped short off along a certain imaginary line; the figure seems abruptly broken, not only on one side of this line, but on both. That is all; there is nothing more to indicate a joint, and as the surface stands, as with such a good—I had almost written *invisible*—joint it is almost sure to, the test of the straightedge, it may be regarded as being an exact and perfect fit.

With such nicety and exactness, indeed, can an expert joiner or cabinet maker work, that with some woods the joint is only to be recognised by noticing the figure. True, an amateur craftsman can hardly expect to reach this standard, but the novice will know what his aim should be, and by a little attention to the method of working he will be in a better position to make a good joint than the man who goes about it anyhow. Let us take the plain glued joint first of all, and when this is considered go on to the stronger and more serviceable dowelled joint, as well as that formed by ploughing and tongueing.

The plain joint is serviceable enough for thin wood, say for anything under half-inch thick, and in certain situations for material of any substance. When practicable, however—that is, when the wood is thick enough—the novice will find it safer not to depend on plain glued surfaces only. With thin stuff, however, he must do so, as there is no room for dowels.

In any form whatever of "jointing up" the same general principle of working must be observed, so we will begin at the beginning, remembering that the object is to get one wide board formed by connecting several, or it may be only two pieces. Let us suppose the planks are quite in the rough. The first idea that occurs to the tyro will probably be the necessity of smoothing two of the edges so that they may come in close contact with each other.

But here occurs the question—are the edges to be planed, or are the boards to be got nice and smooth first? Assuming my position as instructor for the novice (I hope some of my readers may favour by reversing the position as far as any craft they are connected with is concerned), let me say that this must depend on circumstances. If the boards when joined will be too wide and cumbersome to smooth, then do so before they are joined; but if the width will not be great, say not over two feet, it will be better to plane them when they are together.

Should the boards selected be very rough, they may be gone over beforehand with the "Jack" plane just to get them into fair working order. This, however, is not necessary, and whether to do so or not may safely be left to the discretion of the worker. It will also be seen that widths of over that given will in ordinary cabinet work seldom be required, so it may almost be taken as a definite rule that wood is smoothed over after it has been joined.

The "Jack" plane has been referred to, and I suppose that even but few intending workmen will need to be told that with it the coarser planing is done; but, in any case, we are concerning ourselves with joints, not with planes, so it must be taken for granted that the ordinary forms of this tool are familiar to the worker, if only by name. And here please note that the ordinary "Jack" plane and the trying plane, though very similar in appearance, cannot be used indiscriminately in preparing edges of boards for jointing, nor can the smoothing plane be used so efficiently as the trying plane for the same work. I may almost go the length of saying that a long joint could not be made perfectly with a smoothing plane. This statement ought, perhaps, to be qualified a little, for I am aware that some workmen can joint up with the smoothing plane just as some persons can write with the left hand, but it is not usually done. No; the trying plane is the proper one to use. It cuts finer than the "Jack," and its greater length gives it an advantage over the smoothing plane in planing up a straight edge.

Well, with the long plane known as the trying plane the edges of the board which are to be glued must be got perfectly straight. Get one of them so first, as it will serve as a test for the other. Whether it is perfectly straight or not can easily be ascertained by casting the eye along it, as one does when looking along a gun barrel. Irregularities can easily be detected in the length of the cut, and in reducing any remember that a fine shaving or two will make all the difference. Whether the edge is at right angles with the surfaces of the wood cannot, however, be determined by this means, and it must be tested by the square. For short lengths the ordinary shooting board will be found invaluable, but it cannot be used with long pieces. As long and short are only comparative, I ought, perhaps, to say that anything over three feet may be considered long, but, of course, very much depends on the length of the shooting board. In cabinet work a board six feet in length would be decidedly called a long one, and such only require to be used for sideboard tops, wardrobe ends, etc. etc.

When one piece has been got ready with a perfectly straight edge, the other may be prepared to fit it, and the two should be tried together before gluing them. With short joints both edges should be perfectly straight and level. To try them fix one in the bench screw with the prepared edge uppermost, then take the other and note if it fits closely. If the boards are fairly thick it will not require much experience to know by the feel whether the joint is a good one, or, rather, whether both edges are true. The feel of properly worked edges when rubbed against each other is not easy to explain in words, but it almost may be described as suction. It is almost imperceptible, but is to be distinctly recognised by trained hands. This is alluded to, not so much because the novice can be expected to do such accurate work, as to show those who have no opportunity of seeing good cabinet work in progress what their aims should be. We are almost all more or less familiar with the appearance of things when made up, but comparatively few have an opportunity of seeing work in progress, and I wish to convey to those who have not, as far as may be, some idea of the actual manipulation of material as practised in the workshop. Naturally, it will be a very faint reflex of the actual, but at the same time it will be better than nothing, and if the details seem tedious, remember that in reality the work is much more so. Here, however, I must pause, and leave further remarks on this subject for another paper.

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OUR GUIDE TO GOOD THINGS.

60.—The Cartoon Collector's Frame.

It is a relief to turn for a time from the consideration of lathes and appliances of a more solid character to articles that have the charm of absolute novelty, or, at all events, newness of adaptation, such as those which I am now permitted to illustrate and describe, and which are manufactured and supplied by the "Surprise" Box-Table Company, 3, New Inn Yard (186 A), Tottenham Court Road, London, W. Although the first of these is not yet in the market, or, at least, was not in the market when the inventor furnished me with particulars about it, and the second, in its various forms, or, as suited to various purposes, has barely touched it, and is as yet but little known, it is desirable, I think, to call attention to them thus early that retail dealers, many of whom read WORK, may seize the opportunity of making arrangements for agencies for their sale, and that, if the inventor grants licences for their manufacture, makers of such goods may hasten to secure the right of manufacture in their respective localities, for, unless I am very much mistaken, both the one and the other will meet with a large and ready sale.

The object of the "Cartoon Collector's Frame," to use the words of the inventor, "is to provide a picture frame with a recess at the back, in which prints, etchings, drawings, etc., may be stored, to enable those who use it to change at pleasure the print on view next the glass, and to store such additions as may be made to the collection from time to time, affording thus a continual variety of pictorial effects in the decoration of a room or other place." This is, of course, from the home or collector's point of view, but professional men, in many cases, can turn the invention to good account, as it would enable a dealer to keep and display some of his stock to the best possible advantage. Again, by its aid, any architect, designer, or artist could collect and place his drawings and sketches, one at a time, under glass for inspection, and an advertiser could make good use of it to secure diversity of treatment and varied exposition for his notices. Moreover, by a simple arrangement of mechanism the frame can be lowered at pleasure from its place on the wall and raised again to it, and even more than this, the frame can be accommodated to the picture by transposing it from a horizontal to a vertical position or *vice versâ* at will.

Thus, in one and the same frame prints may be framed, stored, and changed, and the frame itself may be lowered, raised, and transposed at pleasure, and these various operations can all be carried out quickly and easily. When closed and in position, the frame, whether in a horizontal or vertical position, looks just like any ordinary picture frame, as all means of movement are in no way conspicuous, but, by merely touching a spring under the centre of the frame, it slides downward, stopping in its length. The front of the frame, it will be found, is secured by a button, and when this button is turned the front will open and fall forward in a slanting position, thus affording facility for a change of the picture in front or for adding to the contents. Thus, in Fig. 1, the frame is shown open, but in its proper position, and a stay is shown by which the front is prevented from opening beyond a certain extent. The picture behind the glass may be supposed to have fallen forward on and with the front, and then we see that behind it is another flap, between which and the back pictures may be stored. This is shown more clearly, perhaps, in Fig. 3, in addition to a complete exposure of the interior, also shows the means of transposition, which is effected by holding the sides or ends of the frame between the hands, and moving them laterally from left to right or right to left, according to the position the picture may require. The picture cord is attached at its ends to a bar, on which are two buttons, on which a piece of semicircular form moves by means of a slot of the same shape cut near its edge. To this is attached another piece on which the frame itself slides. The frames are made in many various sizes, to take pictures from royal quarto (11½ in. × 9 in.) to atlas (33 in. × 26½ in.), selling respectively at from 7s. 6d. to £1 17s. 6d. when supplied in oak.

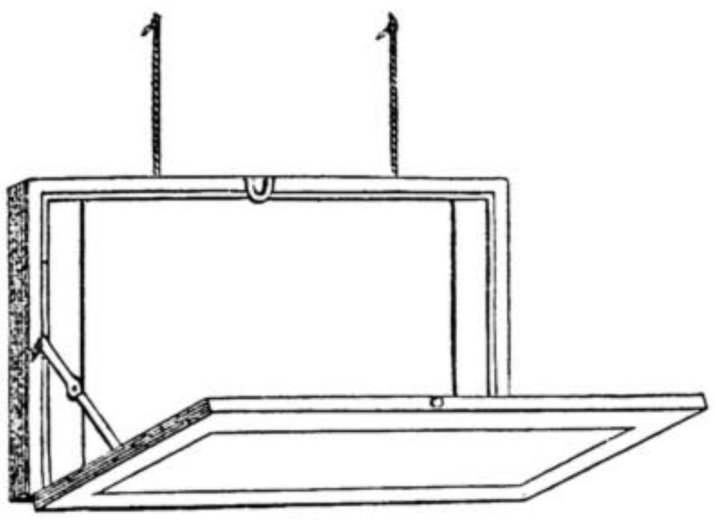

Fig. 1.

Fig. 2.

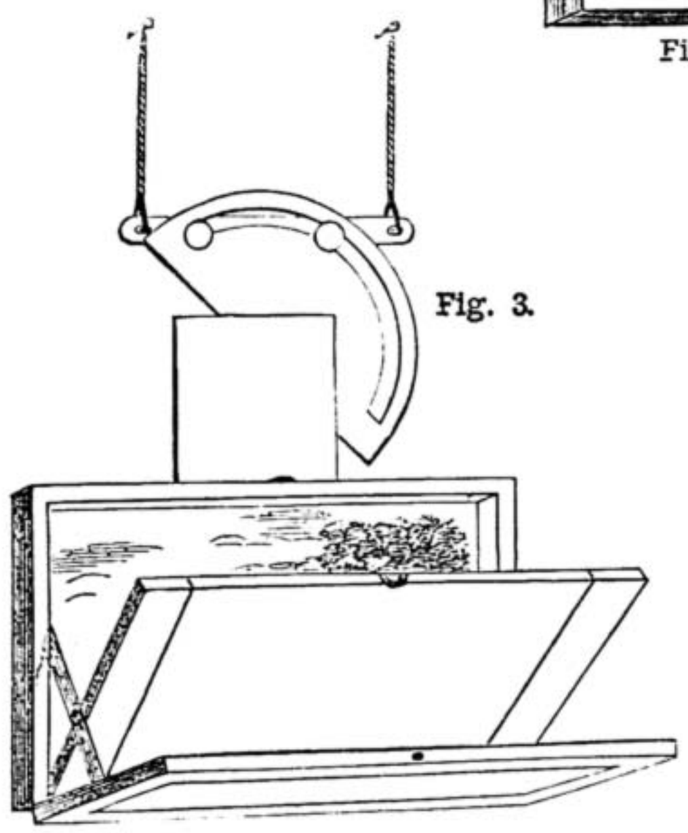

Fig. 3.

Fig. 1.—The Cartoon Collector's Frame: open. Fig. 2.—Ditto: transposed and closed. Fig. 3.—Ditto: open.

61.—The Artist's "Surprise" Box-Table.

This ingenious invention enables what is apparently nothing more than a simple box or case with a handle for transportation from place to place, and a surrounding cincture, to be turned with very little trouble and very quickly into a table displaying every convenience for artists' work, as shown in Fig. 4. The height of the table when opened out for use is 27 in.; its size, when closed up, that is to say, when in its box form as shown at C, in Fig. 4, is 14¾ in. × 11⅜ in. × 4¼ in., and its total weight is 8 lbs. The artist's table is supplied at present in two forms—No. 1 and No. 2. The former costs £2 10s., made in oak, walnut, or mahogany, or £2 15s. if polished. The latter is supplied with three trays for pastels, and fold-over flaps for table, and is supplied at £3. Waterproof bags to contain the box-table when in transit are to be purchased at 3s. each. No more complete or portable apparatus can be imagined for the use of artists. It may be bought in other sizes than that given above at proportionate prices, and the principle is applied in the same manner to box-tables for writing, match scoring, chess and other games, luncheon, and for work-box and toilet purposes, storage being provided in every case for all necessary articles in connection with the purpose for which each box-table is made. Supposing the box-table to be closed, as at C, all that is necessary to bring it to table form is to unbuckle the strap, and, holding the box firmly between the feet, to lift the upper portion evenly until the legs of the trellis work shown in Fig. 4, at A and B, are drawn up to the stops. Then, lifting the catch, the cross bars at the bottom must be turned towards the trellis feet till the catch drops in the slot and holds. Lastly, gently press the top down till all the feet are tight up against the bars, when the table will be found perfectly rigid. To close the box, all that is necessary is to release the check at the bottom and press downwards, when the table will shut up and resume its original box-like form. At A, the table, when opened, is seen as from the front, the top being lifted, to form an easel. At B, it is shown as seen from behind. Within the box are the levers by which the parts within are elevated or depressed. These parts come out of the lower case, and consist of an upper portion forming table, material case, and easel, and a tray with divisions for colours, brushes, dippers, etc., and a lower portion forming a tray for the palette and support for brushes, etc., when painting. There is a recess in the lid in which two millboards, each 13¾ in. × 10¾ in., may be carried, with means to keep them from touching. The lid is adjustable to any angle, and provided with check rests for sketching board. The bottom is furnished with a spike to hold to the ground. When closed, a strap is passed round the centre, or a metal band with lock and key is used to keep all secure. A camp stool may be carried with the box under the strap to complete equipment, and if it be considered desirable to provide means of obtaining shade and shelter as well as rest, an umbrella may be added which may be placed under the strap that surrounds the box and holds the camp stool in durance until released to meet the needs of its owner.

THE EDITOR.

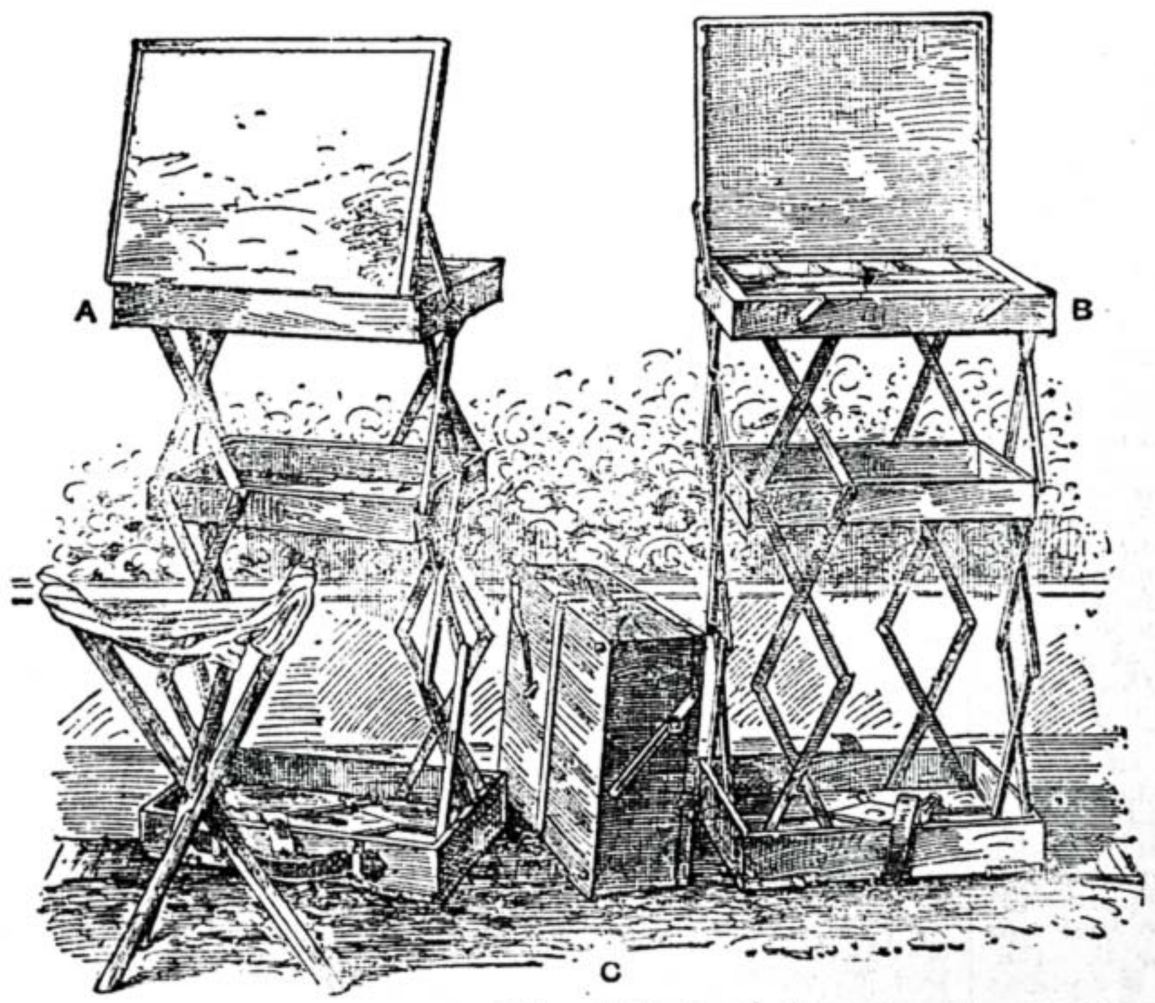

Fig. 4.—The Artist's "Surprise" Box-Table in Position for Use, showing Front (A) and Back (B), and Appearance when closed.

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SHOP:

A Corner for Those who Want to Talk It.

*** *All Communications will be acknowledged, but Answers cannot be given to questions which do not bear on subjects that fairly come within the scope of the Magazine.*

I.—Letters from Correspondents.

Securing a Patent: My Experience.—Ajax writes:—"Having made up my mind to apply for a patent, my first step was to get the Patents, Designs, and Trade Marks Act, so as to get the fullest information. This can be obtained from Eyre and Spottiswoode, price 1s. 10½d. And having learnt that the Patent Office Library (25, Southampton Buildings, W.C.) is open free till ten o'clock each evening, I spent several evenings there, after I had done work, searching the Index Books, to make sure I should not be infringing any existing patent, examining specifications and drawings made out by the various agents, and taking notes to assist me in making out my own. Having procured the necessary form of application for provisional protection, which can be had free, at No. 6 Room Royal Courts of Justice, I filled them up at my leisure, and took them back to the Royal Courts of Justice to get them stamped, the cost of which is £1. This gives protection for nine months. I then deposited them at the Patent Office close by. During the next few weeks I was kept well supplied with circulars from patent agents, offering to get it through for me. But as my funds would not allow of this, I was obliged to dispense with their services. Some I received from America and Canada, which I declined for the same reason. About a fortnight after my application I received a letter from the Patent Office objecting to the title I had given as being of a fancy nature. The letter went on to say, 'If, as appears from the description, the invention is an improved apparatus to facilitate, etc., this should be clearly stated in the title.' I understood by this that if I wanted a fancy title I should have to register it as a trade mark, and that the only title the Patent Office would accept was the one indicated in the letter. I accordingly made the necessary alteration; and shortly afterwards I received a notice to say my application had been accepted. My next step was to hire a small workshop where I could work for an hour or two in the evening. And as my invention was an article complete in itself, I thought I would make several, and advertise them, and as I sold them use the money to increase business. This appeared to be very good in theory, but it was very different in practice. I had some circulars printed giving a full description of the apparatus, and inserted a few advertisements in suitable papers. I received many replies from all parts of the country, asking particulars and name of nearest agent where it might be seen. The only answer I could give was that I had no agent at present near them, but would send article on receipt of cash. This was like buying a pig in a poke, and looked so much like a swindle that it is not surprising that I heard no more from them. Now and then, one more venturesome than the rest would forward the money. But they were too far between to be of much help to me, and I found myself gradually getting into difficulties. Five journals, including *Invention*, kindly gave an article in its praise, and I received several testimonials. This gave me the hope that if I could hold out long enough I might succeed in the end. The months flew by, and it became necessary for me to send in my complete specification. I got the form in the same way as before (unstamped), made out my drawings, and wrote a more detailed account of my invention, clearly stating in what I claimed protection. And as the Patent Office made no objection, I received my patent in due course by post, twelve months after my first application. The stamping of these papers cost £3, making a total cost of £4 for the patent. This was the last straw. I had secured my patent, but I found myself very much in debt. Most working men with a family know what that means. It means a long struggle before you get straight again. I gave up making, and tried to sell the patent. And now for the first time I began to see the advantage of employing a patent agent. Had I been able to do so at first he would have been interested in trying to find a customer for it. I also found that capitalists have very little confidence in a patent that has been secured without the aid of an agent. Of course, if a man in business makes an improvement in an article that he has already before the public, it is all very well. But my advice to any one without capital who has something new is to place it in the hands of an agent to get it provisionally protected, and place it in the market at once, so that the buyer bears the expense of patenting it. But should he prefer to act for himself, there is nothing to prevent him doing so. Of course, being in London, I had a greater advantage than any one would have who lived in the country. But there are many cheap excursions to London which a man might take advantage of; and while his friends were sight-seeing, he could spend the day at the Patent Office, where there is every convenience for writing out specifications. And they could be stamped and deposited at the office the same day." [You have doubtless done the only thing I could advise—namely, to submit your invention to dealers in instruments and persons connected with the musical profession. I myself am not competent to give an opinion on it, for I cannot play any instrument myself, and know nothing about music. Possibly some patent agent might take it in hand even now, on payment of the necessary fees. At present it is, I presume, worth nothing to you, or, rather, bringing in nothing; and if it were possible to do so, I would rather dispose of it for a small sum and recoup even the original cost of the patent than permit it to be utterly unprofitable. I daresay it may be objectionable to you to adopt this course, but after all it is only a common-sense way of looking at and dealing with the matter. I cannot help you to *sell* your patent.—Ed.]

In Praise of Work.—J. P. R. (*Liverpool*) writes:—"I purchased the first copy of Work as a matter of curiosity, and I was so pleased with the lucid manner in which the various articles were written, that I have continued to take it weekly. Not only so, but I bring the paper under the notice of my friends whenever an opportunity occurs. It is just the kind of paper required by amateurs, for it goes so thoroughly into details that the 'merest tyro' could not fail to understand and work out the instructions set down for his guidance. I wish you particularly to kindly convey my personal thanks to Mr. David Adamson for his very valuable, graphic, and lucid articles published in Nos. 2 and 3 of Work on artistic furniture—'An Overmantel.' I read the paper with great interest, and was so struck with the simplicity of the work described, that I determined to commence at once and make an overmantel myself from the drawing shown in No. 2 of Work. In the first place, I may say I am an amateur, pure and simple, never having earned sixpence at joiners' work in my life, with very little spare time, and very few tools; but I find a great amount of work can be got through by an amateur when his heart is in his work. I commenced the overmantel on April 1st, and had it finished and in its place on the mantelshelf on Saturday, May 21st. I have only an hour or two in the evening, and that not every day, and part of Saturday afternoons, in which to do the work. In making the overmantel I have kept to the design, but varied the measurement, so that the work when finished would be the entire length of the mantelshelf; in place of wood panels to the doors I have fitted sheet-glass, with a shelf in each cupboard for books. Fitted in the back are four pieces of plate-glass mirror; the woodwork finished with dead black and gold, and varnished. The entire cost, including timber, plate-glass mirror, glass for doors, ironmongery, paint, gold leaf, and varnish is 35s. For which sum I consider I have a very artistic and handsome piece of furniture—so much admired, that all who have seen it are so struck with the originality of the design that they are anxious to possess one like it. My answer is, 'Subscribe to Work, and commence to make one yourself.' Not only do I consider it handsome and cheap, but from the very fact of having made it oneself, enhances its value in the eyes of the worker. I shall be very pleased to show the overmantel to any subscribers to Work that may reside in my neighbourhood, and give any information they may desire, if they will call upon me any evening after seven p.m. I wish you all prosperity with your new undertaking—Work; and trust it is, and will continue to be, a financial success."

Bronze Blue.—W. B. (*Lenton*) writes:—"I hereby send you a suggestion with reference to your excellent paper Work, which I hope you will work out. Excuse me for taking the liberty for sending this. But on page 158 in 'Shop' you will find under the heading 'Litho Bronze Blue' what I wish to point out. That answer is only of use to the person who asked for it. Would it not be as well to put the question with all short ones, so that others may understand them, and so that those who are in the same trade might make use of them, and know what they are using them for? Is the question one of the blue sticking on the stone, or what?"—[Your suggestion, which is a useful one, shall be followed as far as possible. All who answer questions are requested to show by their answer what the nature of the question was. If questions were put briefly, and written on a separate piece of paper, each could always be given before or above the answers to it. But not one correspondent in twenty observes this rule, which, if universally adopted, would greatly facilitate matters. The question asked was—"I had a job to work in bronze blue, and it was rather inclined to take the work off the stone, and I should be very much obliged if you could give me any information so as to prevent that occurring again; if so, you would greatly oblige."—Ed.]

Sharpening Carving Tools.—D. D. writes:—"Notwithstanding J. W. B.'s remarks in page 172 about sharpening carving tools, the method he advocates is decidedly an amateurish one, and is open to several objections. Instead of fastening the slips in a handscrew, a much better way is to practice the method adopted by most, if not all, good practical carvers, who certainly would not prefer it unless it were better. This is the advice of one who knows."

Lesson for Lesson.—J. H. (*Walthamstow*) writes to the effect that it is easier to learn how to do anything when we are *shown* how to do it, than when we are *told* how to do it. He suggests that one reader of Work should give a practical lesson, say, in carpentry and joinery, to another reader, in exchange for a practical lesson in some other trade, and would be glad to hear the opinion of fellow-readers. This is the pith of J. H.'s letter, which I am obliged to give in this way in order that all readers of Work may easily arrive at his meaning. —Ed.

Per Contra.—C. G. W. (*Barnsbury*) writes:—"Although 'only a clerk,' with an earnest desire to 'spoil wood,' as described by one of your correspondents in Work, permit me to congratulate you, despite the criticism which, even if justified, might have been made in a less high-handed and less conceited style than your correspondent has done. Probably if the truth were known he is not in the first rank of his craft, and, perhaps, he will permit me to inform him that the more one knows the less he thinks he knows, and he is the more anxious to learn more. It therefore follows that it is only the ignorant who fancy they know all. I should strongly advise your correspondent to start a paper on the lines he suggests, if, as he contends, he has a better knowledge of the wants of readers than a firm who are one of the largest, if not the largest, publishers in England, may be, in the world, and who annually issue a greatly diversified amount of literature. In conclusion, may I be allowed to make a suggestion that will be of benefit to the amateur and professional alike, and that is, that in the description of the manufacture of an article the approximate price of each part, and of the whole when finished, be given?"

Measuring up Painters' Work.—A. H. (*Edinburgh*) writes:—"As an admirer and anxious reader of your valuable little Work, I venture to suggest that when the series of papers on house painting come out in your journal, you might see your way to introduce a few practical remarks on measuring. This is a branch of the business that very few painters understand thoroughly. There are books on this subject, but more practical knowledge would be gained from one in the trade. The reason I write this is that the papers on sign writing and lettering are so ably written that this subject, I am sure, would be properly treated; and, speaking as one connected with the trade, I know that the remarks would be appreciated. I wish your grand little paper every success."

Enlargement of Work.—F. A. C. (*Bradford*) writes:—"I beg to say that I, as one of the readers of Work since its birth, would very much like the paper to be doubled, or even trebled; and I quite hold with T. J. H. (*Trowbridge*), and I think that there will be a lot of grumbling until it is made into a larger paper (price 3d.). It is nearly impossible to treat all amateur and professional work fairly in the little space you have allotted. I am not grumbling, because I myself have had my share of oats, doing mostly woodwork, fretwork, etc. I wish every prosperity to Work, and hope that it may be made larger."

About Work.—G. B. P. (*Birmingham*) writes:—"Allow me to congratulate you and the powerful staff at your command in answering us correspondents in all parts of the provinces, and I must say on the behalf of workmen here and myself, that in bringing out Work in its present perfection it will do us all good from a practical and monetary point of view, and I for one have no hesitation in saying that Work is the premier paper for any amateur or professional man to study; but of course you must be tired by this time of having so much praise sent you, but in sending your answers to correspondents I cannot help but praise your inestimable Work."

About Work.—Artisan writes:—"I have taken in Work since the beginning, and as a practical man think it likely to prove on the whole a very useful paper for workmen of all kinds. If it has a fault, to my idea, it is amateurish. Probably amateurs bulk largely (more largely, perhaps, than professionals) in your circulation, but still I hold that sound workshop methods of construction would be much more satisfactory all round than some of the makeshifts so largely adopted by amateur tradesmen, and sometimes advocated by contributors to your paper. This, as I have hinted, is the only fault I have to find with Work, and I have taken the liberty of writing you, not through any carping, fault-finding spirit, but from a sincere desire to assist in making the paper even more useful as a workman's friend. Please do not suppose in what I have said above that I am making any reflections on the ability of the contributors to Work; on the contrary, I believe them one and all to be thoroughly competent teachers of the various crafts they write about, and that, sir, is just the reason why I feel uneasy when I see talented writers such as they are sometimes advocating methods of construction which they know would not be tolerated in any workshop in the country. Under these circumstances I was very glad to see your remarks in this week's paper in defence of your review of ponderous and expensive tools. I thoroughly agree with you in all you say there, and I say review every new labour-saving tool that comes under your notice, either large or small, or Work will not be so useful as it might and ought to be to the professional reader. I intend availing myself shortly of the undoubted ability of your staff. Your 'Shop' column is a valuable privilege, which I should be sorry not to take advantage of; meantime I shall not trouble you further than by asking you to review as early as you can the new dovetail cutter produced by the Britannia Company to work on circular saws."—[As soon as I have sufficient information about the dovetail cutter, or, better still, have seen it, I will report on it in "Our Guide to Good Things." I put your letter into type, because it is helpful with other readers. Amateurs, as well as professionals, read Work, but the latter largely predominate, and it is very largely bought

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by the rising generation of workmen. It is just because the modes of construction described "would not be tolerated in any workshop in the country" that they are described. A mode of construction that is strong, stable, and serviceable, is not to be ignored or regarded as belonging to, or fit for, the amateur alone, because it is not the stereotyped method adopted in the shops. It is not "scamping," and I am not ashamed to say that I prefer work done fairly, strongly, and well, even by bye paths of construction, to things thrown together in the legitimate way perhaps, but bearing the impress of haste and want of care when you look into them, the looking-in, perhaps, being induced by the evident tendency of the parts to part company, through the article being of rickety constitution. I append these remarks to your letter, not with any idea or wish to deprecate accepted methods of construction, but to point out that there can be no absolute need to proceed on stereotyped lines, if any other method which saves time without lessening strength can be followed. Both modes are good of their kind, and the workman can follow whichever he prefers, or whichever he thinks is best suited for the job in hand without incurring blame.—ED.]

II.—QUESTIONS ANSWERED BY EDITOR AND STAFF.

Material of Kitchen Utensils.—F. C. (*Bedford Row*).—They are made of sheet iron coated with tin. The "block tin" plates, technically termed "doubles," are superior to the commoner kinds, first, because the covering of tin is thicker, and secondly, because they are well hammered upon a polished anvil, the better to consolidate the metal. —J.

Tools for Home Work.—R. R. W. (*Glasgow*).—When you ask me to decide without knowing a great deal more of your aspirations than you tell me, what are the best tools and fewest to buy for home work, such as model engine making, etc., I am puzzled to know how to answer you. That "etc." may include such a lot; then do you want to make your own patterns and castings, or to get the latter and fit them up? I shall presume the latter, in which case you might make shift with two or three files, a drill stock, a die and taps for screws, and one or two other small things, such, for instance, as those recently described in our articles on boring cylinders. A lathe also is a convenience, if not indispensable. It depends really so much on the exact class of work you wish to undertake that it is almost impossible to say more than I have; but if you will write again, and state the sum you contemplate spending on tools, I will make out a list of those which, in my judgment, would be the fewest and best.—D. A.

Art Repoussé.—(*Glasgow*).—See answer to W. E. S. (see page 205) for transferring and address for tools. Hammer and handle together should weigh from 3 to 4½ ounces. Pitch, 11 parts; resin, 7; tallow, 1; and brickdust 5, will make a very good composition; but Gawthorp's special cement can only be obtained of him, at 16, Long Acre. In mixing the above, powder the brick finely, and add, after melting and mixing, the others, stirring all the time. By "tooling over" the raised parts is meant putting in the fine texture of feathers, leaves, cloth, skin, etc., after those parts have been raised from the back, and is done by lightly and skilfully hammering a very fine tool, according to the texture required, over those parts. This is very difficult, and is more easily learnt by practical tuition than by explanation. It greatly enhances the effect of the work.—G.

Broom and Brush Making.—T. M. (*Rochdale*).—The fibre, or bast, a specimen of which you enclose, is made up into small bundles of a size sufficient to enter the holes made in the wood, and then fixed by running melted pitch into each hole. If you are going to try to make brooms and brushes for your own use, be careful with the melted pitch; fill the holes with fibre, one by one, fastening each in succession with the pitch, melting it in a can or tin furnished with a spout or nozzle, and hold the fibre firmly against the bottom of the hole when you are pouring in the pitch.

Paper for Pasted Papier-Mâché.—J. H. S. (*Romsey*).—The paper made specially for pasted papier-mâché is of a grey colour, about the thickness of medium blotting-paper, but rather more close and firm in texture, and unglazed. It is now made to order only, and may be procured through Messrs. McCallum & Hodson, Summer Row, Birmingham, who would doubtless give particulars as to price. There are plenty of papers answering to the above description to be bought at any paper warehouse which would do equally well. The special paper has no especial merits.—S. W.

Scale for Bassoon Stop.—AMATEUR ORGAN BUILDER (*Arundel*).—Your wish for a small scaled "bassoon" stop for your organ can be carried into effect by making the pipes the same diameter at the top as those of the open diapason an octave higher in pitch. Thus, your 8-foot C bassoon would be the same diameter as the 4-foot C open diapason. I presume you know that the bassoon is a reed-stop, and that the wood pipes are conical in shape, with the point at the bottom which fits into the boot containing the reed. If made of wood, these pipes are square on plan; if metal, they are circular. The "gemshorn" is a flue pipe of a conical shape, the point in this case being at the top. At the mouth, where it joins on to the foot, it should be about one scale less than the open diapason for the same note; and at the top it should be one-third of that diameter. Cut up the mouth rather more than a fourth of its diameter, and nick rather finely. You are in error in supposing that this stop is used only for chamber organs; it is used both as an 8-foot and as a 4-foot stop on many large organs, and there is one in the beautiful organ at the Temple Church, London.—M. W.

Soldering Iron.—H. A. (*Chesterfield*).—I wish your queries were of a specific character, because when you ask for "hints" I do not know precisely what kind of hints to give. In reference to soldering, of course you know that the first essential is absolutely clean surfaces, first scraped and then covered with a flux, to prevent the formation of oxides, or to dissolve them as soon as formed. Resin, or spirits of salts killed with zinc, are used. The soldering "iron," more properly the "copper bit," is first heated to a dull red, quickly cleaned with a file, rubbed on a piece of sal-ammoniac, and dipped into solder; being then wiped with tow, it is ready for use. The copper bit being drawn along the edge of the joints in contact, both melts the solder and warms the work. The copper bit must not be overheated, or it will not pick up and distribute the solder.—J.

Guide to Photographing.—P. C. G.—The best thing P. C. G. can do will be to obtain an elementary book on photography, of which several excellent ones are published. Burton's "Modern Photography," or "Photography for Amateurs," by T. C. Hepworth (Cassell & Co.), are thoroughly reliable and easily understood. These columns are scarcely adapted for a course of instruction in any art, the space being limited.—D.

Papier-Mâché Trays for Photographic Purposes.—J. G. B. (*Dudley*).—The black japan varnish with which papier-mâché is covered would resist acids for a long time, but, as any accidental injury to this coat would place the paper at the mercy of the chemicals, J. G. B. is scarcely advised to adopt papier-mâché trays. His other query he will find answered in our reply to J. H. S. (*Romsey*).—S. W.

Wood for Fret Sawing and Carving.—WOOD SPOILER.—I repeat part of my reply to E. G. (*Ipswich*) in No. 8, page. 126. With reference to fretwork, wood may be bought of R. Melhuish and Sons, 85 and 87, Fetter Lane, London, E.C.; Henry Zilles, 24 and 26, Wilton Street, Finsbury, E.C., and Charles Churchill & Co., 21, Cross Street, Finsbury, E.C. To these I may add the names of Messrs. Thomas J. Syer & Co., 45, Wilson Street, Finsbury, E.C., of whom wood for carving may be obtained. In Liverpool wood for fret cutting may be obtained from G. Busschotts, Park Lane; in Bath, of Fritz Collins; in Settle, Yorkshire, of Messrs. Harger Bros.; in East Dereham, Norfolk, of Messrs. J. H. Skinner & Co.,; and in Dublin of Booth Bros. From most, if not all, of these wood may be bought for turning or carving. I shall be glad to be favoured with the names of dealers in wood of all kinds in all large towns and other localities. I should then be able to refer any applicant to the dealer that is nearest to his own place of residence.

Carpenters' Bench, etc.—NAIOS.—You shall have the description of one or two carpenters' benches before long; a strong bench of the ordinary form, and a folding bench for light work to fall back against the wall to which it is attached. It is difficult, as I know from experience, to do without one. A paper for mounting a small grindstone has just been sent in by a valued contributor to WORK, and shall appear as soon as I can find room for it. The boards of a kitchen table may be tongued and grooved, or pointed up by dowels. You can get a patent iron tonguing and grooving plane for about 10s. 6d.

Advertisements in WORK.—AD FINEM.—I am glad to find that you are making progress in carpentry by the aid of WORK. With regard to the advertisements that appear in each number, I can only say that there are many who find them to be useful, and value them accordingly. For my part, I am disposed to think that in time to come they will be considered as constituting one of the most valuable portions of WORK, inasmuch as they will form ultimately a finger-post and directory which will help the workman to many a useful article which he might possibly look for in vain, were it not for the seasonable *vade-mecum* placed at his disposal by the very pages to which you are now pleased to take exception. It must be understood, to avoid useless repetition, that with regard to future letters on this subject I can do no more than refer their writers to this reply.

R. T. (*Bolton*) and A. B. T. (*Wycombe Marsh*) are requested to consider the above as a reply to their letters also.

Tarnished Clock Dial.—S. F. (*Gubal*).—You made a mistake in cleaning it the first time, as, in doing so, you cleaned off the lacquer, the only thing is to thoroughly clean it again with bath brick, and finish off with whiting, then give a coat of lacquer, when it will be good for years. If it gets dull or dirty wipe over with a damp cloth; the circle with the numerals on should be silvered, when it will show up the hands better, as well as the lacquered brass.—A. B. C.

Naming Deal and Pine Woods.—TYRO (*Edinburgh*).—Yellow and white deal are usually known as "deal," although pine may be so called. For instance, you speak of a "deal box;" you mean one made of pine, not of any hard wood. In the trade a "deal" is understood to be a size—*i.e.*, 2½×9, 3×9, or 4×9.—A. J. H.

Covers for Bookbinding.—M. W. M. (*East Dulwich*).—C. Hindley & Son, Oxford Street, sell the Japanese leather paper. Liberty's had remnant bundles at 1s. and 1s. 6d. lately. I know no good manual on the subject.—E. B. S.

Books on the Power Loom and Weaving.—D. B. (*Perth*).—A good book on the subject is "Spinning Woollen and Worsted," by W. S. Mc. McLaren, 4s. 6d., published by Cassell & Co., Ludgate Hill, London, E.C.

Castings for Engine Cylinders.—T. W. (*Gray's Inn*).—Go direct to the founders. There are very few good steel founders in the market. From ample knowledge of their castings during several years past I can recommend Jessop's and Hadfield's, both of Sheffield, but I question if they will care to undertake such small work as you want; neither would the castings be of much use for your purpose; but you may try. You must not use wood for patterns that is liable to warp. Thus, you should not use elm, ash, or unseasoned mahogany or pine, otherwise, almost any wood will do for patterns. The best of all is mahogany. By the way, is not your cylinder of 2 in. bore and 2 in. stroke rather oddly proportioned?—J.

House Painting.—HARLOW.—Our correspondent desires help in estimating for external house painting in a country place about twenty miles from London. Prices of house painting are materially governed by the rate of wages paid in the district in which the work tendered for is situated. For instance, house painters' wages in best part of metropolis is 8½d. per hour, whilst in the outlying districts and suburbs 7d. and 7½d. would be the general rate of payment. In the present instance we assume that the painter's wages in the district indicated is 6d. per hour, and that our inquirer has no personal experience of such work wherewith to gauge the cost of the job. Let him, therefore, in the first place, examine carefully the condition of walls, the putty of window glazings, which frequently requires replacing, and, if necessary, provide for repointing round doors, etc., as well as the first-mentioned plasterers' or masons' work. The cornices, sashes, and doors should then be separately noted, and allowed for at the following prices:—Cornices, if consisting only of plain mouldings and no ornamental casting, and if within reach of a ladder which one man can with safety handle, 6d. to 8d. per yard, lineal or "run," as it is usually termed; if cornice has dentils, or such like enrichment, and requires more labour for ladder, etc., from 10d. to 1s. per yard, lineal, would be a fair charge. Window sashes, frames, sills, etc., if in fair condition, and twice painted, finished in two colours, 2s. 6d. to 3s. 6d. each, according to the size and number of squares of glass in each. If *sashes* are to be grained oak and varnished also, add for these two processes, 1s. 3d. to 1s. 6d. extra to above. Front doors either grained oak and varnished, or plain colours and varnished, are worth the same, since the latter must have more care and preparation to look well than the grained work, where the "figure" takes the attention of the eye, usually requires. The most ordinary front door is worth about 5s., and ranges for a good panelled door and door frame of a large house up to 30s., and higher. For the plain cemented wall-work 6d. per square yard, for two coats "white lead and oil" paint, should pay our correspondent if the house is a fair distance around and within reach of, say, a 40-round ladder. If much of the wall space is above a height of 40 ft., then more strength and time will be necessary to handle ladders with which to execute the work, and 8d. per square yard for two coats must be charged. Four coat work on new cement would be worth about 1s. to 1s. 3d. per yard, according to the convenience, etc., above mentioned. Beyond these prices very little written advice or help can be given, since much still will depend upon the condition of the work, the situation of job, its management and practical supervision, the cost of material differing very considerably between the large employer and a small buyer, and upon which questions the profit or loss depends very materially. Practical experience and observation are the best standards of judging house painting by, and although we, from personal experience and knowledge, can confidently recommend the prices given as being fair pay for fair work, we recommend the inquirer to exercise every care lest he should burn his fingers. After calculating the job on the scale given, it would be a good plan to check it, if possible, by judging the probable cost of time, materials, and incidentals required for its execution: should this leave a margin of about 20 per cent. between the measured estimate and the latter calculation, a fair tender would have been arrived at by that scale. To such as HARLOW we recommend the careful study of our practical treatise on house painting, which will shortly appear in WORK.—F. P.

III.—QUESTIONS SUBMITTED TO CORRESPONDENTS.

Small Furnace.—G. T. M. (*Liverpool*) writes:—"Would a reader kindly tell me how to make a small furnace for melting steel, as I am going to make some steel castings, and also what kind of sand to use for moulding?"

Cylinder Marine Engine.—BON FIL asks for "dimensions, etc., for making a working drawing of a two-cylinder marine engine and boiler to be fitted into a boat, 5 ft. long by 9 in. broad, and 7 in. deep, made of sheet iron."

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Gear Wheels for Lathe.—C. E. H. (*Warrington*) writes:—"I should be very much obliged if you could inform me where I might obtain two pairs of gear wheels, one pair 2 in. in diameter, the other pair ½ or ¾ in. in diameter, to form back gearing for a lathe of 1½ in. centres, which I am making. Please let me know as soon as possible through your 'Shop' column, as I am waiting for them. I am well pleased with your paper."

IV.—QUESTIONS ANSWERED BY CORRESPONDENTS.

Polishing Oak Floors.—G. B. P. (*Birmingham*) writes in reply to H. N. (*Bexley Heath*) (see page 174):—"If you cannot get the required polish on your oak floor with beeswax and turpentine, adding plenty of elbow grease, why not varnish it, scrape off your wax, and give three good coats of the following, and you will have a good hard polish that will last for years:—1 lb. shellac, ½ lb. resin, and 1 quart of naphtha; thoroughly shake till dissolved, and apply with a 2½-in. camel-hair brush. If you would rather wax it I will send you instructions and a good recipe with pleasure."

Wood Colouring.—G. B. P. (*Birmingham*) writes in reply to OX GALL (see page 174):—"You want a good old oak stain. Procure a pint of turpentine, and add ½ pint of Brunswick black, and you will have a good and cheap stain for your pine overmantel. You cannot dull polish without a lot of work (not properly), but try three coats of fine spirit varnish; after each coat sandpaper with No. 0 paper, and after last coat of varnish brush well with pumice powder."

Glaze for Finishing French Polishing.—G. B. P. (*Birmingham*) writes in reply to W. H. B. (*Redditch*) (see page 174):—"Glaze used in French polishing is made by dissolving ½ lb. gum benzoin in 1 quart of methylated spirits. Thoroughly pound up the benzoin, then add to the spirit, shaking well every day for a week, then strain, and it is fit for use. Why not finish with pure spirit, as glaze is only fit for common work?"

Sounding Board of Dulcimer.—W. S. M. (*Leeds*) writes in reply to DULCIMER (see page 174):—"I see in your issue of WORK for June 1st, an application for the dimensions of a dulcimer sounding board. Dulcimers are made in several different sizes, according to the pitch of tone required. If your applicant will communicate with me, stating whether he merely wants a dulcimer for home amusement, or suitable for platform, or playing with other instruments, I shall be pleased to forward him the information he requires, or I can supply him with an instrument, if he prefers buying to making one. Last year I was awarded a bronze medal and certificate at the People's Palace, London, for improvements and richness of tone in the manufacture of dulcimers and mandolines."

Pattern of Plane for Casting.—A FOREMAN PATTERN MAKER writes in reply to E. P. W. (see page 172):—"Though there is some advantage in casting a piece across the mouth of the plane, I do not think it at all necessary if soft Scotch iron is used. If inferior hard iron is employed, then it is well to thicken the metal. Actually the metal where the iron has to bed would not come to a keen or 'feather edge' in any case, as that edge would be cut off in the pattern, and in addition there would be the allowance of extra thickness for planing on the bottom—say $\frac{1}{16}$ in. or $\frac{3}{32}$ in. Then there is the strip cast across the inside face, to give the iron a bedding above the bevelled facet, and this keeps the metal rather hotter there than elsewhere, and so tends to prevent chilling. As a matter of fact, all the outside surfaces of an iron plane are hard when they leave the mould, but such hardness is only skin deep, and is removed by grinding, previous to using the file. I may add also that I speak from experience, but admit, at the same time, that the class of metal used will have a vital influence on results. I particularly mentioned, however, soft castings in my article, page 50."

Etching on Steel.—G. T. (*Landport*) writes in reply to EXCELSIOR (see page 125):—"The reason for my writing is in consequence of EXCELSIOR asking in 'Shop' for a practical substance for etching on steel. The substance which I have used very successfully for etching names on steel tools is sulphate of copper or common bluestone, which can be obtained from any druggist; a pennyworth will do a good deal of work. The way I use it is this: I take a small crystal of the bluestone, and crush it into powder, and then add to it a very small pinch of salt, and moisten it with a little water; then, having written the name in soap in the ordinary way, I drop the moistened bluestone on to the writing, and after letting it stand for two or three minutes, I wipe it off, and it is marked quite plainly. Of course, the longer it stops on the deeper it goes. This is when I have a few names to mark, but when I have a quantity I make a solution of bluestone; and for etching designs I think this would be by far the better plan. To make the solution I crush some crystals into powder, and put them in a small bottle with a small quantity of common salt, and pour hot water on them, and shake until all is dissolved. It is best to keep adding the powdered crystals until the water will dissolve no more; by this means you will get the strongest possible solution. If kept corked, this will keep its strength for months. In using this for etching designs it would be advisable to make a ridge of soap outside of the design, so as to keep the liquid from running off on to other parts."

IMPORTANT PRIZE COMPETITION.

THE Editor of WORK has the pleasure of informing his readers that Messrs. CASSELL & COMPANY, LIMITED, have placed at his disposal the sum of

THREE GUINEAS,

to be distributed in Prizes for Competition for Designs for a small Bookcase, to contain the Volumes of

CASSELL'S NATIONAL LIBRARY,

which, at the close of the present year, will have attained the aggregate number of TWO HUNDRED AND EIGHT. The books are in themselves of world-wide interest, and may be regarded as forming the front rank of our British classics.

In order to give a fair and proper idea of the space or accommodation that will be required in the Bookcase for the whole of the volumes up to the close of 1889—two hundred and eight in number, as already stated—it is desirable to say that each volume, bound in cloth, is $5\frac{7}{8}$ inches long, 4 inches wide, and about ½ inch thick; or, to be more precise, the linear space filled by thirteen volumes is $6\frac{3}{4}$ inches in length, which admits of the volumes being placed on the shelves without any possibility of being crowded too closely together, to prevent easy withdrawal of any single volume at pleasure. As 13 is the sixteenth of 208, the space required for this number of volumes can be easily calculated.

In order to give satisfaction to as many competitors as possible, the Editor of WORK thinks it desirable to divide the sum offered by Messrs. CASSELL & COMPANY into Three Prizes, as follows:—

FIRST PRIZE	...	One Guinea and a Half.
SECOND PRIZE	...	One Guinea.
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Intending Competitors are placed under no restriction as to Form, Arrangement, or Ornamentation, as it is the Company's desire to elicit from the readers of WORK an Original Design for a Repository for the Four Years' Issue of the National Library up to the close of the year 1889 that may be regarded as the most convenient and desirable for the purpose indicated.

Competitors should send in WORKING DRAWINGS to SCALE not later than August 31, 1889, and addressed, carriage paid, to

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LUDGATE HILL,
Prize Competition. LONDON, E.C.
Cassell's National Library.

A motto must be affixed to each set of Drawings, and the name of the sender, etc., enclosed in a sealed envelope bearing *the same motto*, which must be transmitted by post, under cover, to the Editor of WORK.

The Drawings sent in Competition will be submitted for adjudication to Three Competent Practical Men, who will select those that are deemed worthy of prizes.

The Prize Drawings selected will become the property of Messrs. CASSELL & COMPANY, LIMITED, who will return all Designs made by unsuccessful competitors to their respective owners, carriage paid.

The Awards, with the names and addresses of the successful competitors, will be announced and engravings of the Prize Bookcases given in No. 30 of WORK, published Oct. 9th.

NOTICE TO CORRESPONDENTS.

*** In answering any of the "Questions submitted to Correspondents," or in referring to anything that has appeared in "Shop," writers are requested to refer to the number and page of number in which the subject under consideration appeared, and to give the heading of the paragraph to which reference is made, and the initials and place of residence, or the nom-de-plume, of the writer by whom the question has been asked or to whom a reply has been already given.

Trade Notes and Memoranda.

A CORRESPONDENT in the *American Machinist* recommends the following for improving burnt steel:—Reheat the steel, and cool in a solution proportioned thus: 1 gall. of whale oil, 2 lbs. of resin, 2 ounces black oxide of manganese, the whole to be hot and well stirred at time of using. The same correspondent recommends using a lead heating bath to prevent the danger of burning small tools.

FILES whose teeth are cut with a gradual increase in pitch, *i.e.*, in degree of coarseness, from the point towards the tang, are largely used in America. They are called "increment cut" files, and are cut by machinery. They work more sweetly than the ordinary files, being less liable to chatter.

UP to the present date, on the Manchester Ship Canal works, about 15½ millions of tons of earth and rock have been excavated, while 28 millions more have to be removed. It is thought that the work will be completed in two years from the 1st of January next. There are on the works 183 pumping engines, 82 steam navvies, 5,000 waggons, 158 locomotives, and 116 steam cranes, and in a few months 15,000 men will be employed.

A COMPANY has been formed to manufacture a new white lead, which is stated to possess certain important advantages over the ordinary compound, such as permanence of colour in a bad atmosphere, and increased covering power for a given weight. Ordinary white lead, as is well known, consists of the carbonate; the new compound is the sulphate. It is prepared directly from galena by roasting in a furnace, and condensing the fumes or vapour of sulphate of lead, which is formed by the oxidation of the sulphide. The sulphate is collected from the condenser, washed with weak acid, and after drying is ready for the market.

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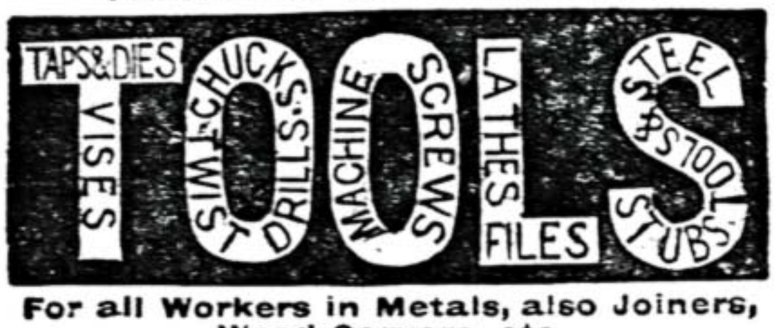

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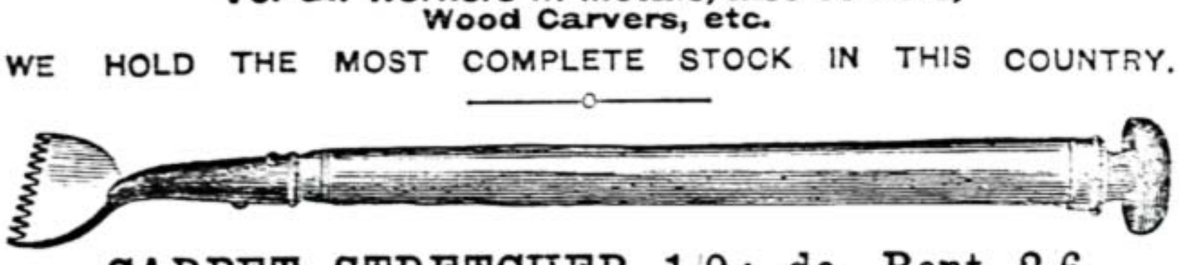

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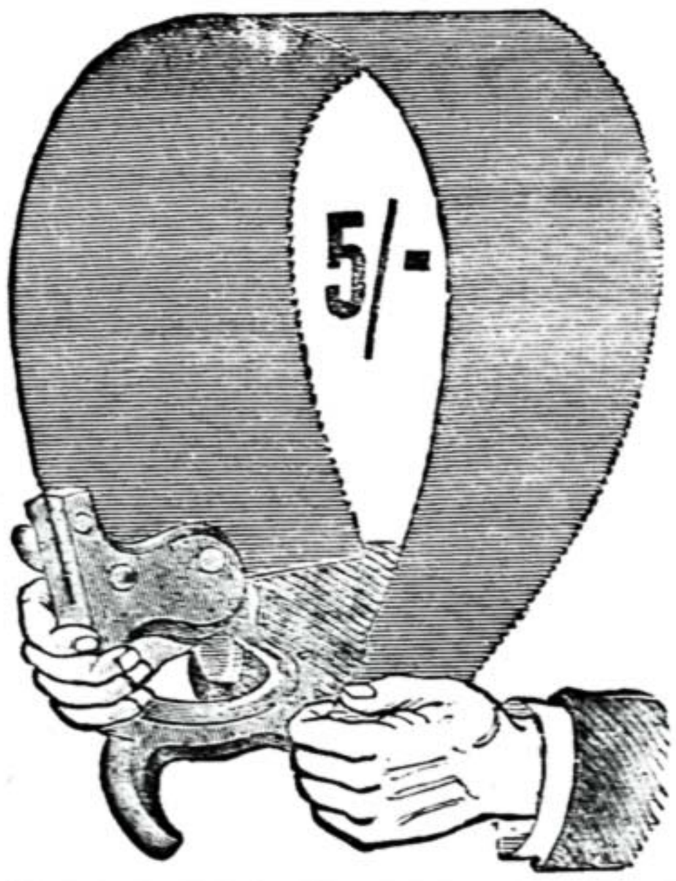

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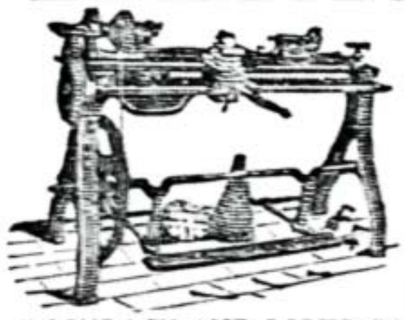

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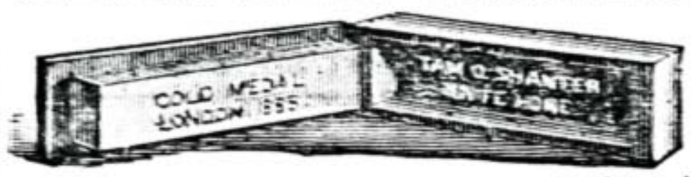

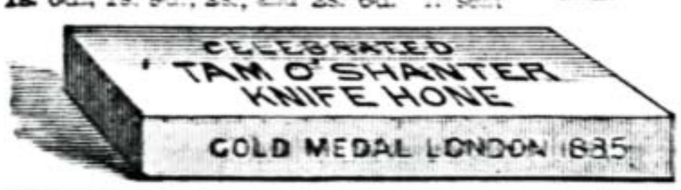

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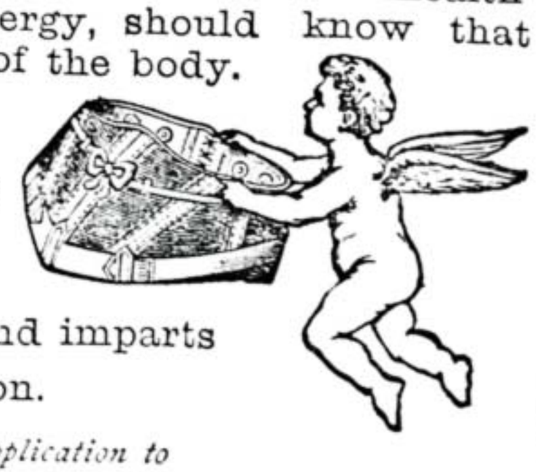

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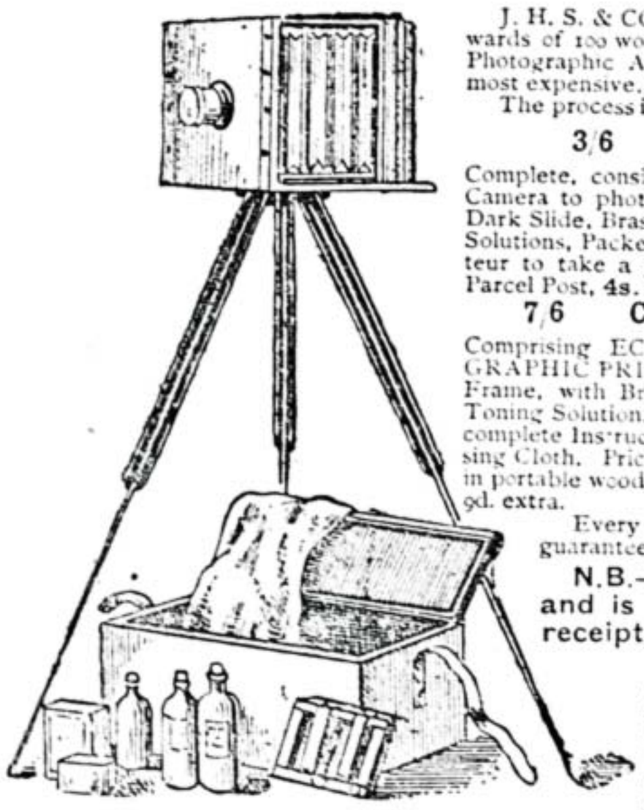

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